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POLLUTION OF THE NAVIGABLE WATERS OF MOBILE BAY AND ITS TRIBUTARIES - ALABAMA. CONFERENCE HELD AT MOBILE, ALABAMA ON JANUARY 27-28, 1970. TRANSCRIPT OF PROCEEDINGS

Federal Water Pollution Control Administration
Washington, D. C.

1970

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PROCEEDINGS

Mobile River

Tensaw River

January 27-28, 1970
Mobile, Alabama

Dog River

MOBILE BAY

CONFERENCE

In the Matter of Pollution of the Navigable Waters of Mobile Bay and its Tributaries – Alabama

Mississippi Sound

Bon Secour Bay

U. S. DEPARTMENT OF THE INTERIOR • FEDERAL WATER POLLUTION CONTROL ADMINISTRATION

555

CONFERENCE

IN THE MATTER OF POLLUTION
OF THE
NAVIGABLE WATERS OF MOBILE BAY
AND ITS TRIBUTARIES

held in

Mobile, Alabama
January 27-28, 1970

TRANSCRIPT OF PROCEEDINGS

-1.

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MR. STEIN: The conference is open.

This conference in the matter of pollution of the navigable waters of Mobile Bay and its tributaries, involving the State of Alabama and the United States Department of the Interior, is being held under the provisions of Section 10 of the Federal Water Pollution Control Act.

Under the provisions of the Act, the Secretary of the Interior is authorized to call a conference of this type when he finds that substantial economic injury results from the inability to market shellfish or shellfish products in interstate commerce because of pollution subject to abatement under the Federal Act, and action of Federal, State, or local authorities.

The purpose of the conference is to bring together the State water pollution control agency, representatives of the United States Department of the Interior, and other interested parties to review the existing situation and the progress which has been made, to lay a basis for future action by all parties concerned, and to give the State, localities and industries an opportunity to take any indicated remedial action under State and local law.

Both the State and Federal Governments have responsbilities in dealing with water pollution control problems. The Federal Water Pollution Act declares that the States have primary rights and responsibilities for taking action to abate and control pollution. Consistent with this, we are charged by law to encourage States in these activities.

At the same time, the Secretary of the Interior is also charged by law with specific responsibilities in the field of water pollution control in connection with pollution of interstate and navigable waters. The Federal Water Pollution Control Act provides that pollution of interstate or navigable waters, whether the matter causing or contributing to the pollution is discharged directly into such waters or reaches such waters after discharge into a tributary, which endangers the health or welfare of any person shall be subject to abatement.

The October 1965 amendments to the Federal Water Pollution Control Act additionally empower the Secretary of the Interior to initiate enforcement procedures whenever he finds that substantial economic injury results from the inability to market shellfish or shellfish products in interstate commerce because of pollution of interstate and navigable waters, and the action of Federal, State, or local authorities.

This conference on pollution of the navigable waters of Mobile Bay and its tributaries is the fifth to be held under these shellfish provisions of the Act. Of course, as the representatives of the shellfish industry and some others know, we have a tremendous case in Washington's Puget Sound involving discharges from paper mills and injury to the Pacific oyster industry. That conference was called on the initiative of the Governor of Washington. The four earlier shellfish-provision conferences were all held on the East Coast, involving New York--and this was on Long Island in the Moriches Bay area. Some of you people may remember that there we had the situation of the shellfish industry and the Long Island duck industry both trying to exist in the same waters, and with the ducks doing what ducks do naturally, this affected the shellfish industry. Hopefully we have all the duck farms gathering their wastes and treating them now.

We had one in Maine in the Penobscot Bay area, and there you may recall we had some municipalities in the area plus some paper mills and some chicken processing plants. I think again we have a schedule worked out where remedial program is under way in all cases and hopefully we are opening that to shellfish harvesting again.

We also have had a case in New Jersey and this involved all of New Jersey from the Shark River area down through Cape May. And if you examine the map, that is a little below Toms River, New Jersey, all the way down. We came up with a program there which required no treatment of any effluent at all into the bay areas on the landward side of the barrier islands there, where we have shellfish production, that has a high degree of treatment and then is discharged out to the sea. So when that takes place, there will be no discharge of any wastes, treated or untreated, into the shellfish-producing areas and that should effectuate a cleanup.

And then in Massachusetts, and that involved the Boston Harbor area, where admittedly shellfish was a small part of the pollution problem, but that is where the Federal Government had its jurisdiction. With the cooperation of the Boston and the State authorities, particularly the interest of the Governor of Massachusetts we have a real widespread cleanup program in the Bostom area.

The experience we have gained from these four enforcement conferences, and several other interstate and intrastate conferences held throughout the years, has shown that each area of concern presents its own unique features. Many pollutional causes and problems are shared in common from city to city, but the particular local geographic and socio-economic factors of the area always form a good part of our consideration. And I think a more detailed analysis of the cases that I have outlined will indicate that while we have a pretty generalized area of experience, we have come up, in conjunction with the State and local authorities and the industries concerned, with a different solution in each of these problems. I think when we are dealing with the shellfish States, this is one thing that has to be recognized.

In dealing with the shellfish States we are dealing with a very, very complex situation. They have probably one of the most complex situations in the field of water pollution control. In other cases, we can just come up with a remedial program in terms of the kind of waste treatment and expect pretty much of a direct effect on the results.

In the shellfish cases we have to analyze the area, the particular flows in the area, the location of the shellfish beds and their potential, and work out a very, very carefully integrated program in order for it to work. And then we have to keep on top of that, because, as you people know, in the shellfish business we can't have any mistakes. If we did make a mistake, the results would be pretty catastrophic both to the people and the shellfish industry, and we have to proceed on that basis. We ask you all to recognize that in giving your statements here and to recognize the problems that confront the conferees.

Opening Statement - Mr. Stein

Today's conference will cover the effects on interstate commerce caused by pollution of the shellfish beds in Mobile Bay. We expect the conference will be useful in providing a clear picture of the problem, delineating the progress which has already been accomplished, and in indicating what needs to be done to correct the pollution problem, if any exists, in these navigable waters.

As specified in Section 10 of the Federal Water Pollution Control Act, the Secretary of the Interior has notified the official State water pollution control agency, which is the Alabama Water Improvement Commission, of this conference. The Alabama Water Improvement Commission will be represented by Dr. Ira Myers and Mr. J. L. Crockett.

The Federal conferee, to my right, is Mr. John White, who is **Acting Director of the Regulatory Programs Office** in Southeast Region for the Federal Water Pollution Control Administration, with headquarters in Atlanta.

My name is Murray Stein. I am from headquarters FWPCA, Interior Department in Washington, D. C., and the representative of Secretary Hickel.

The parties to this conference are the official State water pollution control agency and the United States Department of the Interior. Participation in the conference will be open to representatives and invitees of these agencies and such persons as inform me that they wish to present statements. However, only the representatives of the State water pollution control agency and the Department of the Interior will constitute the conferees

We are going to dispense with introductions of the various notable people who are in the audience, and I recognize many national experts and old friends. This is because we have a lot of material to present and we want to utilize all the time for the presentation.

Now a word about the procedures governing the conduct of the conference. The conferees will be called upon to make statements. The conferees, in addition, may call upon participants whom they have invited to the conference to make statements, and in addition we shall call on other interested individuals who wish to present statements. At the conclusion of each statement, the conferees may be given an opportunity to comment or ask questions, and after that I may ask a question or two. This procedure in the past has proven effective in reaching equitable solutions.

Given the complexity of the problem and the formidable task facing the conferees and the real issues that I think we are going to have to face in this problem--and they are not easy ones (questions of the effect of certain municipal and industrial waste discharges on these waters, if any, and on shellfish)--I ask all participants to really make an effort to try to be as brief, concise and to the point as possible. Try to be as factual as possible in order to come up with these recommendations and conclusions and points of view that can be helpful to the conferees in their consideration of the problem. No one is going to be cut off Everyone is going to be given an opportunity to say what he believes to be pertinent. But I am asking you to cooperate with us and try to make this as hard hitting and concise a meeting as we can possibly have.

At the end of all the statements we will have a discussion among the conferees, which will probably be an executive session, and try to arrive at a basis of agreement on the facts of the situation. Then we will probably reconvene and read a statement orally attempting to summarize the conference, giving the conferees, of course, the right to amend or modify the summary at that time.

A record and verbatim transcript of the conference is being made by Mrs. Virginia Rankin for the purpose of aiding us in preparing the summary and providing a complete record of what is said here. It usually takes about three or four months for the transcript to come out in printed form. If you wish a record beforehand, you can check with Mrs. Rankin, who is an independent contractor, and make your own arrangements with her. I would like to point out that we do not print the color, so take that into account and take into account that any visual aids you may refer to will be reproduced in black and white and try not to refer to color in presenting your graphic aids as they might be meaningless when the transcript is prepared.

We will make copies of the transcript and summary available to the Alabama Water Improvement Commission, and have generally found that for the purpose of maintaining relationships within the States, the people who wish summaries and transcripts should request them through their State agency rather than come directly to the Federal Government. The reason for that is that when the conference has been concluded, we would prefer people who are interested in the problem to follow the normal relationship in dealing with the State rather than the Federal Government. This has worked successfully in the past and we will be most happy to make this material available for distribution. And I think this is particularly the case with Alabama.

I would just like to place a personal note. I know I have personally worked through the years, and this has been many years, with Dr. Myers, Mr. Crockett, and Mr. Beck in Alabama, and I think that once the conference is concluded the day-to-day relationships of the people in this constituency rest with the Alabama Water Improvement Commission and our role is to aid and assist the State in carrying out the program. We have worked this way in the past and I hope we are going to continue to work this way in the future.

I would suggest that all speakers and participants other than the conferees making statements come to lectern and identify themselves for the purposes of the record.

I would like to just emphasize one more point before we get started--that we do not accept questions or comments from the floor. When I ask for questions or comments I am referring to the conferees. The reason for this is that if we did, we probably would be here for months. But that does not mean you do not and will not have your say. Just hold your questions, hold your comments and anyone who feels that he has something pertinent to say will be given a full opportunity to come up and say it.

With that I would like to call on Mr. White for the Federal presentation.

Mr. White.

JOHN C. WHITE, ACTING DIRECTOR
REGULATORY PROGRAMS OFFICE, SOUTHEAST REGION
FWPCA, ATLANTA, GEORGIA

MR. WHITE: Thank you, Mr. Chairman.

And I in turn would like to call on Mr. Paul Traina, who is Director of our Technical Programs Office at the Southeast Water Laboratory in Athens, Georgia.

Mr. Traina.

PAUL J. TRAINA, DIRECTOR TECHNICAL SERVICES, SOUTHEAST WATER LABORATORY, ATHENS, GEORGIA

MR. TRAINA: Thank you, Mr. White.

Mr. Chairman, Dr. Myers. My name is Paul Traina, Director of Technical Programs, Southeast Region of the Federal Water Pollution Control Administration.

Mr. Chairman, with your permission, I would like to submit a copy of our Federal report to the recorder for the record.

MR. STEIN: Without objection, this report will be included in the record in its entirety as if read.

(Which said report is as follows:)

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POLLUTION AFFECTING SHELLFISH HARVESTING
IN MOBILE BAY, ALABAMA

MARCH 3, 1849

UNITED STATES DEPARTMENT OF THE INTERIOR
Federal Water Pollution Control Administration
Southeast Water Laboratory
Technical Programs

JANUARY, 1970

POLLUTION AFFECTING SHELLFISH HARVESTING
IN MOBILE BAY, ALABAMA

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Technical Services
Southeast Water Laboratory
Southeast Region
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Athens, Georgia

August 1969

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I. INTRODUCTION

This report summarizes and relates pertinent shellfishing statistics and water quality and waste source information from 1949 through 1969. The cooperation of the U. S. Bureau of Commercial Fisheries, U. S. Public Health Service, Alabama Water Improvement Commission and the Alabama Conservation Department as well as the municipalities and industries in the area, particularly the employees of the city of Mobile, is gratefully acknowledged.

II. CONCLUSIONS AND RECOMMENDATIONS

Conclusions

1. Shellfishing areas in Mobile Bay have been closed by the State of Alabama during portions of eight of the past sixteen years because total coliform densities over the beds exceeded the 70/100 ml total coliform standard for shellfish harvesting.

2. A comparison of monthly production figures for shellfish harvesting in Mobile Bay from 1954 to 1967 during open and closed periods shows substantial harvesting losses and, consequently, substantial economic losses during the closure periods. The respective average production losses during the months when closures due to pollution have been in effect are 35,000 pounds in February, 51,000 pounds in March and 28,000 pounds in April. The net production loss is approximately 109,000 pounds per year. The corresponding economic losses, based on an as-landed value of 0.52¢ per pound averaged for January 1969 in Mobile and Baldwin Counties, are $18,200 in February, $26,500 in March and $14,600 in April. A recent study of the Florida shellfish industry indicated that the final retail value of shellfish products is roughly four times the as-landed value. Therefore, the annual economic loss to the region ranges from $56,700 (as-landed value of oysters) to $227,000 (estimated retail value).

3. The most significant source of coliform pollution to Mobile Bay is the Mobile River. The coliform pollution entering Mobile Bay from the Mobile River is transported down the western shore of the Bay to the major shellfishing areas during flood runoff periods. The great majority of both total and fecal coliforms entering the Bay from the Mobile River originate in the Mobile metropolitan area.

4. The median total coliform densities in the Mobile River at the mouth during flood runoff periods ranged from 1[illegible]0,000 to 11,000 MPN/100 ml. Seventy seven to 94 percent of this total resulted from discharges in the Mobile metropolitan area. The corresponding range of median fecal coliform densities in the river at the mouth was 930 to 300 MPN/100 ml. Sixty to 79 percent of this total resulted from discharges in the Mobile metropolitan area. During a low flow period examined, the respective median total and fecal coliform concentrations at the mouth of the Mobile River were 9,300 and 2,300 MPN/100 ml. The contribution of the Mobile metropolitan area amounted to 96 to 97 percent of the total coliform densities and 99 percent of the coliform densities flowing into Mobile Bay from the River.

5. Ninety-seven percent of the Mobile area's municipal waste is now receiving secondary treatment and chlorination. However, the coliform density increases in the Mobile River indicate that excessive quantities of total and fecal coliforms are being discharged by Mobile's Threemile Creek and Eslava Creek sewage treatment plants, Chickasaw Lagoon, Stone Container Corporation, National Gypsum Corporation, Scott Paper, International Paper and the untreated section of Mobile.

6. The most significant contributor of bacterial pollution from point sources in the Mobile metropolitan area is the untreated section of Mobile. The median total and fecal coliform population equivalents from this source are 46,500 and 13,700 BPE respectively. This waste accounted for 50.3 percent of the total coliform and 58.3 percent of fecal coliform contributed from all sources. The

second major source is the International Paper Company which discharges 36,040 or 38.9 percent of the total coliform and 6,300 BPE or 26.9 percent of the fecal coliform.

7. The four industrial effluents sampled--International Paper Company, Scott Paper Company, National Gypsum Company and Stone Container Corporation, contribute 43,000 BPE or 46 percent of the total coliform and 8,400 BPE or 33.6 percent of the fecal coliform discharged in the Mobile metropolitan area. The eight domestic waste sources sampled discharged 3,440 BPE or 3.7 percent of the total coliform and 1,500 BPE or 6.1 percent of the fecal coliform.

8. During the short periods of time when they occur, storm water overflows are significant sources of coliform pollution. During the relatively light rainfalls when storm water sampling was conducted, coliform contributions in storm water runoff amounted to 4 to 18 percent of the 92,500 BPE total coliform and 23,500 BPE fecal coliform pollution from point sources. More intense rainfalls would likely produce a greater percentage.

9. There is a direct, though imprecise, relationship between river flow in the Mobile River above Mobile and both total and fecal coliform densities. As river discharges increase, total and fecal coliform densities will also increase irrespective of point sources of waste.

10. The concentrations of total and fecal coliform in the Mobile River above Mobile during high flood runoffs are such that even if the bacteriological contribution from all sources at Mobile were removed and all other conditions remained constant, it is doubtful

whether the 70/100 ml total coliform criterion for shellfish harvesting could be met anywhere in Mobile Bay except Bon Secour Bay.

11. Sewage, storm water overflows, and industrial wastes discharged to the Mobile River from the Mobile metropolitan area, and excessive concentrations of total and fecal coliform in the Mobile River above Mobile during high flood runoff, result in pollution of Mobile Bay by bacteria. Because of this pollution, the State of Alabama under the laws of the State and the rules and regulations of the Alabama State Board of Health governing the production, shucking and handling of oysters, has closed more than 4,270 acres of oyster beds to the direct harvesting of shellfish. These closures have caused substantial economic injury resulting from the inability to market shellfish or shellfish products in interstate commerce. The estimated economic loss to the region ranges from $56,700 to $227,000 annually. Accordingly, the pollution of these navigable waters is subject to abatement under the provisions of section 10 of the Federal Water Pollution Control Act, as amended (33 U.S.C. 466 et seq.).

Recommendations

It is recommended that a pollution abatement program requiring the following measures be instituted:

1. Secondary treatment and effective year-round disinfection be provided for all municipal wastes. Operation of all waste treatment facilities to accomplish the highest possible removal efficiencies at all times. This recommendation is to include the following specific measures for the sources of municipal wastes listed below:

A. Threemile Creek sewage treatment plant (Mobile)--Effective disinfection of waste effluent at all times.

B. Eslava Creek sewage treatment plant (Mobile)--Expansion of plant capacity and effective disinfection of waste effluent at all times.

C. Untreated sewage discharge from downtown Mobile--Construction of interceptor sewers for diversion to McDuffie Island sewage treatment plant. This recommendation is already being implemented.

D. Storm water overflows (Mobile, Prichard, Chickasaw)--Regular maintenance program of debris clearance from drains.

E. Chickasaw waste lagoon--Effective disinfection of waste effluent at all times.

F. Bayou La Batre Daphne, Satsuma, Alabama--Construction of collection system and sewage treatment facilities to replace septic tanks serving individual homes.

2. All industries provide secondary treatment for both process and domestic wastes and effective disinfection where appropriate for both process and domestic wastes. Specifically, the following program is to be carried out by the industries as follows:

Industrial sources	Program
1. International Paper Co. 2. Scott Paper Co. 3. National Gypsum Co. 4. Stone Container Corp. 5. Alabama State Docks	A) Separation of process and domestic wastes. B) Secondary treatment at not less than 85% removal efficiencies and effective disinfection at all times for domestic wastes or connection to the municipal sewer system. C) Secondary treatment at not less than 85% removal efficiencies for process wastes and effective disinfection at all times.

3. The seafood processing plants in Bayou La Batre and other locations in and around Mobile Bay without adequate treatment:

a. Provide screening and separate disposal of gross solids such as hulls and heads resulting from the processing of shrimps, crabs and other seafood products.

b. Provide secondary treatment of wash water resulting from machine peeling, processing and packing of peeled shrimp and the packing of whole, unpeeled shrimp. Such treatment could be provided as part of the municipal waste collection and treatment system.

4. All recommended abatement measures be in operation no later than February 15, 1973, as detailed in the Alabama water quality standards, approved by the Secretary of the Interior on February 15, 1968.

5. In determining acceptability of areas in Mobile Bay for shellfish harvesting, a fecal coliform criterion be employed in conjunction with Salmonella determinations to more effectively

evaluate the probability of pathogen presence. A coordinated effort by the U. S. Public Health Service and the Federal Water Pollution Control Administration in cooperation with the States should be undertaken immediately to develop an acceptable numerical criterion for fecal coliform, for promulgation by health authorities, with respect to approval of areas for shellfish harvesting. A technical committee be established by the conferees to assist in and coordinate the development of an acceptable numerical criterion for fecal coliform. This committee should report to the conferees no later than one year from the date of the first session of conference.

III. BASIN DESCRIPTION

The Mobile River is formed by the junction of the Alabama and Tombigbee Rivers, approximately forty miles north of Mobile, Alabama. The river flows in a southerly direction for some forty-five river miles before entering Mobile Bay. Mobile Bay is a relatively large shallow bay with an overall area of approximately 419 square miles, an average depth of 9.8 feet, and a maximum depth of 60 feet (Figure 1).

The upper three-quarters of the Mobile River Delta is a chain of rivers, bays, bayous, and extensive swamp with a thick growth of trees. The lower one-quarter is treeless, grass-covered wetland marshes and shallow bays. The delta, unlike a typical delta, is hemmed on both sides by high land.

The Mobile River-Mobile Bay drainage basin comprises approximately 2,060 square miles of Mobile and Baldwin Counties. Although the drainage area defined by these limits is relatively small, waters flowing into this basin drain approximately 64 per cent of Alabama as well as portions of Georgia, Mississippi and Tennessee, giving a total of 44,170 square miles draining into Mobile Bay.

The average annual precipitation is 57.5 inches, which is the highest of any basin in Alabama.

Due to the large drainage area and unregulated flood flows on the Alabama and Tombigbee River, the flow into Mobile Bay through the Mobile River system varies widely, ranging from 10,000 cfs during the dry, fall months to more than 532,000 cfs during the spring floods. Construction of reservoirs on the Alabama River should have a considerable effect on the low flow variations. Low flow on the Tombigbee River is somewhat regulated by the Jackson Lock and Dam located near Coffeeville, Alabama.

Flow in the Mobile River is influenced by natural diversion to the Tensaw River below Mt. Vernon. It is estimated that approximately 60 per cent of the flow in the Mobile River is diverted to the Tensaw during periods of low to moderate flows and 50% diverted during high flows.

All waters of Mobile Bay and the Mobile River, as well as all or portions of their tributaries, are influenced by tidal fluctuations. Mobile Bay has one tide daily, with each tidal cycle taking approximately 25 hours. Tidal fluctuations vary from less than one foot during neap tides to two and one-half feet during spring tides.

Major tributaries of the Mobile River include Threemile Creek, Chickasaw Creek and Bayou Sara. Major tributaries entering Mobile Bay, other than the Mobile River, include the Tensaw River, Spanish River, Apalachee River. Blakely River, Dog River, Fowl River and Fish River. The Spanish, Apalachee and Blakely Rivers are straits originating in the Tensaw River.

The principal cities within the Mobile Basin are Mobile, Prichard, and Chickasaw. At the present time, approximately 320,000 people reside in the immediate Mobile metropolitan area. Projections indicate that population will increase to 390,000 by 1975. The upper portion of the Bay and the Mobile River are presently heavily industrialized. However, there are still large tracts of undeveloped land, and expansion of present industries and location of new industries are anticipated. A shipping channel has been approved to connect the Deer River with the main channel in anticipation of an industrial park soon to be constructed on the Deer River.

IV. SHELLFISH MANAGEMENT

A. Procedures

Management of the shellfish industry in Alabama is jointly administered by the Alabama Department of Conservation and the Alabama Department of Public Health. The conservation agency is responsible for protection, propagation, and conservation of shellfish and other seafood resources. The health agency is responsible for carrying out sanitary controls over shellfish growing, harvesting, and handling in the interest of public health. (The term shellfish refers to oysters, clams, and mussels.) (1)(2)

In carrying out its oyster sanitation control program, Alabama participates in the voluntary National Shellfish Sanitation Program (NSSP), administered by the U. S. Public Health Service.(1) Under the NSSP, direct sanitary controls over shellfish production are applied by the individual states. In general, under these controls, shellfish harvesting areas are designated as approved when the following criteria are satisfied: a) the area is not so contaminated with fecal material that consumption of the shellfish might be hazardous; b) the area is not so contaminated with radionuclides or industrial wastes that consumption of the shellfish might be hazardous (this provision applies to the possible presence of toxins); and c) the total coliform median most probable number (MPN) of the water does not exceed 70 per 100 milliliters (ml) and not more than 10% of the samples ordinarily exceed 230 per 100 ml...in those portions of the area subject to the most unfavorable hydrographic and pollution conditions. The U. S. Public Health Service manual states that these limits need not be applied if it can be shown by detailed study that the coliforms are not of direct fecal origin and do not indicate a public health hazard. The Alabama regulations, which constitute the legal standard, do not specifically include this latter provision. (3)

In Alabama, oysters are the only shellfish species in commercial production. The State health agency determines and classifies oyster growing areas. Three classifications are used in delineating sanitary water quality of Mobile Bay for oyster harvesting purposes. Growing areas are classified in the State oyster regulations as "Approved Oyster Growing Areas", "Grossly Polluted Closed Areas", and "Moderately Polluted Restricted Areas".(3) Growing area maps issued by the health agency identify Permanently Closed and Temporarily Open (or Closed) areas. Areas not marked closed are considered open. The areas and sizes are described in Table I. Alabama conducts sanitary surveillance on the bacteriological water quality of open, temporarily closed, and permanently closed portions of Mobile Bay on a year-round basis. These areas are shown in Figure 2.

When sanitary criteria are not met, a closure order is immediately issued by the State Health Officer, with copies of the closure sent to interested State, local, and Federal health agencies, the State conservation agency, various law enforcement officials, and to all oyster plants. The Division of Seafoods of the Department of Conservation is also notified of the required closure by telephone. A typical closure order is contained in Appendix C.

Enforcement of the closure is applied at once by the Seafoods Division, located at Dauphin Island. That agency maintains patrol

FIGURE 2

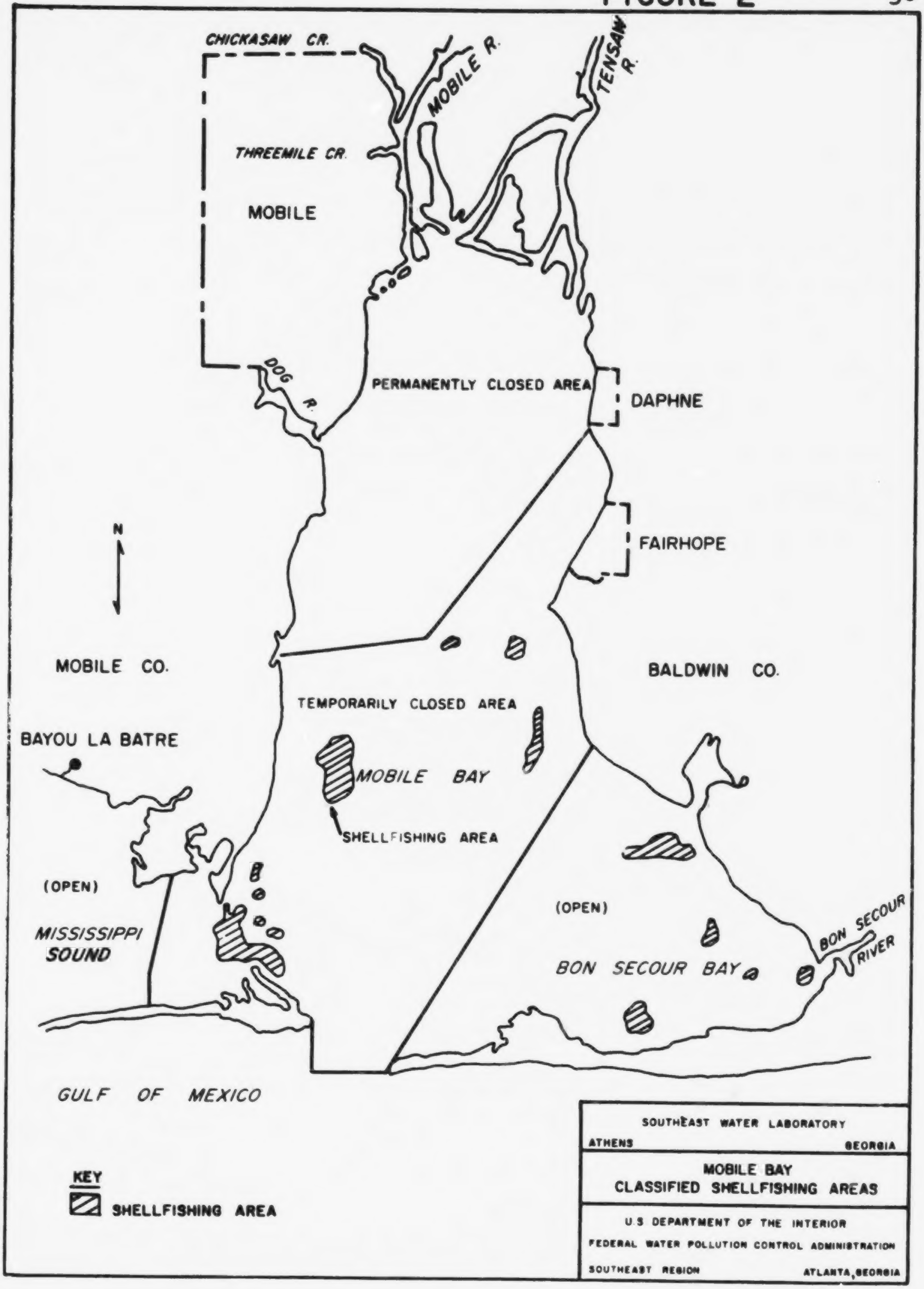

CHICKASAW CR.
MOBILE R.
TENSAW R.
THREEMILE CR.
MOBILE
DOG R.
PERMANENTLY CLOSED AREA
DAPHNE
N
FAIRHOPE
MOBILE CO.
BALDWIN CO.
TEMPORARILY CLOSED AREA
BAYOU LA BATRE
MOBILE BAY
SHELLFISHING AREA
(OPEN)
MISSISSIPPI SOUND
(OPEN)
BON SECOUR BAY
BON SECOUR RIVER
GULF OF MEXICO
KEY
▨ SHELLFISHING AREA
SOUTHEAST WATER LABORATORY
ATHENS GEORGIA
MOBILE BAY
CLASSIFIED SHELLFISHING AREAS
U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
SOUTHEAST REGION ATLANTA, GEORGIA

TABLE I

OYSTER GROWING AREA CLASSIFICATION IN MOBILE BAY

Classification	Square Miles	% of Bay Area
Permanently Closed	119	28.4
Temporarily Closed (or Open)	195	46.5
Approved*	105	25.1
	419	

* Bon Secour Bay = 105 square miles

Mississippi Sound = 124 square miles (not included in above table) operations over various phases of seafood management enforcement including the oyster closure order to prohibit oyster harvesting from permanently or temporarily closed areas. During the period when the temporary closure is in effect, State health authorities continue monitoring the waters. When the State determines that the waters have returned to a satisfactory level of sanitary quality, the temporarily closed area is opened. An opening order is issued by the State Health Officer and sent to essentially the same persons receiving copies of the closure order. A sample copy of an opening order is shown in Appendix D.

Mobile County contains the majority of oyster-producing reefs in Alabama. Most of the oyster harvesters reside in Mobile County with the major portion of oysters harvested in Alabama taken from Mobile County waters. The most productive public oyster reefs in Alabama are in the Cedar Point and adjacent areas located in the southwest portion of Mobile Bay. The important Cedar Point reef and other adjacent reefs are located within the Temporarily Closed area. When the reefs are closed, oyster harvesting is prohibited. Application of the Temporarily Closed Area order has greater impact upon Mobile County than on Baldwin County (see Appendix C).

Other productive reefs are also located in Mississippi Sound and Portersville Bay. These reefs are located outside of the Temporarily Closed Area and are not generally affected by area closures. Most of Alabama's public oyster producing areas are located in the Temporarily Closed area.

Bon Secour Bay is also an important area of oyster production in Mobile Bay. A substantial amount of shellfish harvesting in Bon

Secour Bay comes from privately leased grounds. The Bon Secour area is generally outside the limits of the temporarily closed area and thus is not affected by periodic closures.

The permanently closed waters of Mobile Bay are located in the northern portion of the Bay. The waters of the area do not meet state standards for oyster harvesting areas at any time. Degradation of water quality for oyster production is due to pollution influences from sources in and above Mobile. Oysters in the area are sparse, with few, if any, commercial reefs in existence. Information on potential productivity of the waters is lacking, e.g. suitability of bottoms or aquatic conditions to support growth. (The Division of Seafoods is currently carrying out an inventory of locations and estimated production of oyster reefs in Mobile Bay.) Commercial dredging of old shellreefs is conducted in that portion of the Bay. Dredged shell is used for road building material, feed supplements and other purposes.

B. Oyster Production in Mobile Bay

Information on Alabama oyster harvesting by county, month, volume and value was obtained from the Bureau of Commercial Fisheries, U. S. Department of the Interior.(4) Table II shows that during calendar years 1957 through 1967, Alabama produced 10,647,000 pounds of oysters valued at $3,813,000. Of this harvest, 8,817,000 pounds was produced in Mobile County at a value of $3,096,000. (The proceeding figures have been rounded off to the nearest thousand). Thus, during the period, Mobile County produced approximately 83%, on the

TABLE II

ALABAMA OYSTER LANDINGS AND VALUE BY COUNTY (5)
(In Thousands of Pounds and Thousands of Dollars)

Calendar Year	County				Totals		
	Baldwin		Mobile				
	#	$	#	$	#	$	$/#
1967	268	136	1,818	871	2,086	1,007	0.48
1966	236	101	1,068	508	1,304	609	0.47
1965	188	77	305	128	493	205	0.42
1964	228	88	777	234	1,005	322	0.32
1963	109	44	886	307	995	351	0.35
1962	167	59	277	105	444	164	0.37
1961	147	63	355	97	502	160	0.32
1960	136	46	1,034	271	1,170	317	0.27
1959	112	36	785	242	897	278	0.31
1958	81	25	378	87	459	112	0.24
1957	158	42	1,134	246	1,292	288	0.22
	1,830	717	8,817	3,096	10,647	3,813	

average, of Alabama's oyster harvest, yielding 81% of the value. Mobile County's contribution during this period ranged from 62% to 88%.

Information on the volume of Alabama oysters in interstate traffic is not readily available. However, 39 state certified dealers are shown in the January 1, 1968, issue of the Interstate Shellfish Shippers List. The figure suggests a substantial amount of dependence by the Alabama oyster economy on interstate trade.

Information on quantity and value of oysters as landed was reported continuously from 1957 through 1967. From 1950 through 1956, complete information on both volumes and values was not reported.(4) Alabama oyster harvest landings by calendar years from 1954-55 to 1966-67 are shown in Table I I by oyster season.(4)(5) Data on Alabama oyster harvest and as landed values from the Bureau of Commercial Fisheries are presented on a calendar-year basis.

The Alabama oyster industry is oriented toward harvesting in terms of seasons rather than calendar years; thus, the data were rearranged to reflect production on a seasonal basis (Table III). Although the Director of Conservation is authorized to designate a seasonal closure for conservation purposes,(6) for the last several years no seasonal closure was applied and oyster harvesting was permitted on a year-round basis. Therefore, for the purpose of this report, the season of July 1 to June 30 of the following year was selected to present the data. June, July, and August are low-harvest months in Alabama, and it is recognized that the season

TABLE III

ALABAMA OYSTER LANDINGS BY COUNTY

(In Thousands of Pounds)

Oyster Season	County Baldwin	 Mobile	Totals
1966-67	287	2,010	2,297
1965-66	224	527	751
1964-65	223	219	442
1963-64	172	1,167	1,339
1962-63	69	562	631
1961-62	246	155	401
1960-61	103	696	799
1959-60	135	1,090	1,225
1958-59	87	467	554
1957-58	119	454	573
1956-57	135	1,133	1,268
1955-56	120	715	835
1954-55	138	1,622	1,760
	2,058	10,817	12,875

designation could have just as well start or end during any of these months.

Oyster harvesting is a highly variable phenomenon. Decreased harvest can be caused by closing productive areas because of pollution. It can also be caused by natural factors such as oyster predators, epizootics, low salinity, siltation and other environmental effects. In addition, changes in legal sizes of harvestable oysters can affect production by either increasing or decreasing the potential harvestable legal crop. Harvesting can also be affected by year-round harvesting vis-a-vis seasonal closures for conservation purposes; harvesting of steam oysters by use of power dredges increases the oyster catch if landed in Alabama.* Shifts in oyster fishing pressures caused by harvesters electing to fish for shrimp instead of oysters because of better shrimp prices and/or yield will affect oyster harvests. Thus many variables may be working independently or simultaneously to accelerate, neutralize or mask given effects of any one factor upon oyster harvesting.

From the 1954-55 season to the 1967-68 season, Mobile Bay was closed on six occasions due to pollution.(7) There were eight seasons when no pollution closure was applied. Close analysis is required if any relationship is to be developed between closures and harvest decreases. For example, during the 1961-62 season Mobile Bay was closed. Harvest for the season was 401,000 pounds. The following season (1962-63) the Bay was not closed, and the harvest was up to 631,000 pounds. However, the next season (1963-64) where a closure was necessary, the harvest was up again to 1,339,000 pounds.

*Oysters caught in one state and landed in another are credited to the landing state.

Oyster harvesting in Alabama during calendar year 1967 was 2,086,000 pounds.(8) This is the second highest reported oyster harvest year for Alabama since 1880, when statistics on oyster landings started to be collected.(4) The record year for Alabama was 1951, when 2,191,400 pounds were landed.

During the 17-year period from 1952 through January, 1968, the temporarily open area in Mobile Bay has been closed eight times because water quality over the shellfish beds did not meet State or natural shellfish sanitation program standards. A listing of the closure periods is given in Table IV. The list indicates closure dates but no reopening dates for 1952, 1953, 1961 and 1964. In 1962, two opening dates are given, and in 1965 two closing dates and one reopening date are given. Where closure periods are given without reopening dates the closure is assumed to have been in effect during the remainder of the oyster season.

C. Effects of Pollution Closures on Oyster Production

Information contained in Tables II and III, and as-landed values from the 1954-55 season through the 1966-67 season (including July 1967 through February 1968) were broken down on a monthly basis. Table V summarizes seasonal harvests and Table VI illustrates monthly distribution. Where closures were initiated or terminated in a given month, the oyster landing values during the open and closed periods of the month were proportioned to the periods when the beds were open and closed. This is based on the assumption of generally equal daily production. The earliest closure date is December 31, 1961. Two closures were in January, one in February, two in March, one in April, and one in May.

Figure 3
MOBILE BAY
AVERAGE MONTHLY OYSTER HARVESTING
1954-1968
(Production Loss Due to Pollution)

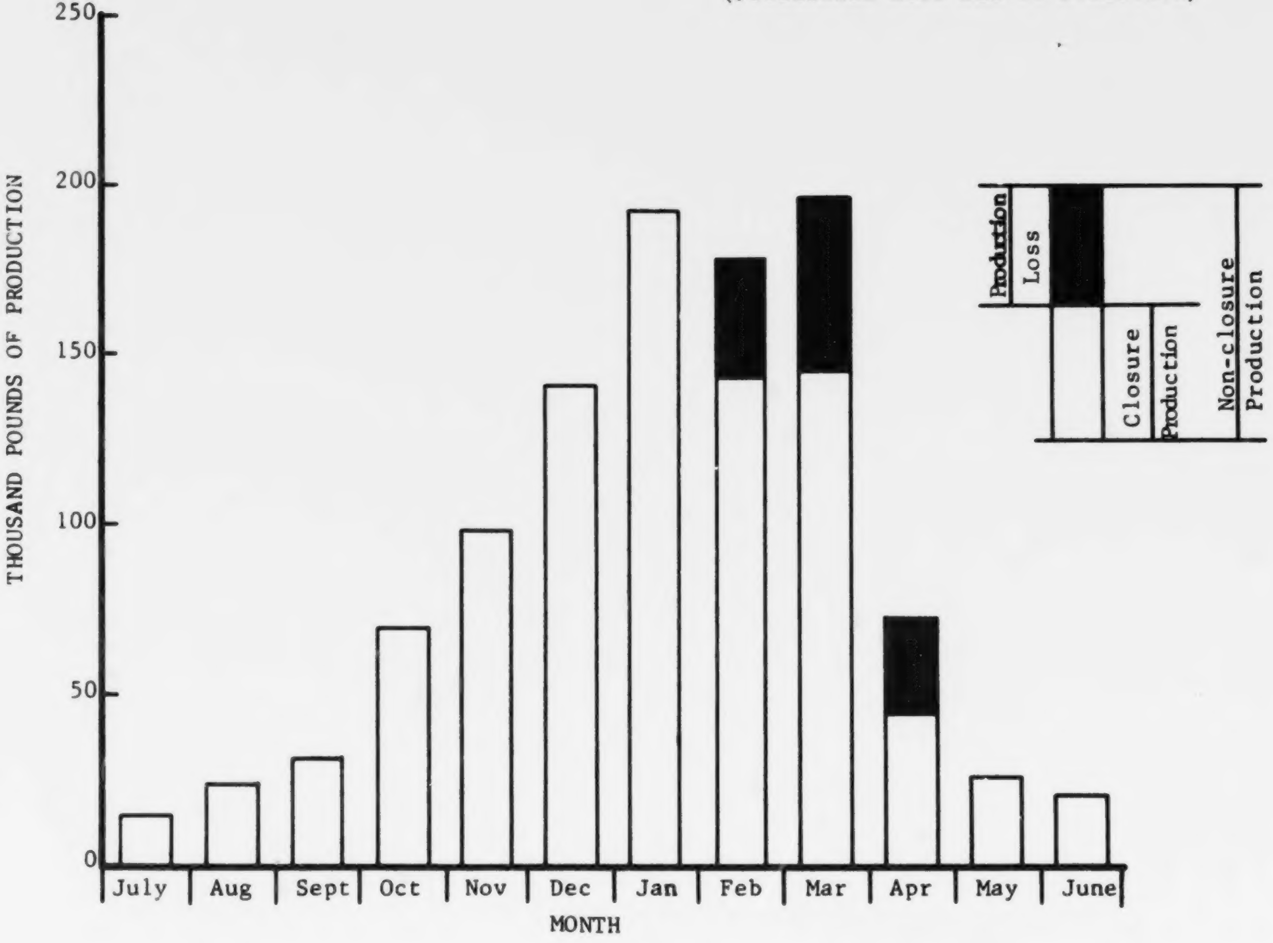


TABLE IV

OPENING AND CLOSING DATES OF OYSTER HARVESTING AREAS (7)*

	CLOSED	OPENED
1952	March 8	
1953	March 22	
1954	Not Closed	October 21
1955	January 14	August 30
1956	April 6	August 28
1957	May 7	September 1
1958	Not Closed	
1959	Not Closed	
1960	Not Closed	
1961	December 31	
1962		September 1, April 11
1963		
1964	March 30	
1965	March 15, February 22	April 9
1966	March 6	April 2
1967		
1968	January 12	March 4

*The Alabama Water Improvement Commission indicated that all closures during May, June, July August were for conservation purposes.

TABLE V

OYSTER HARVESTING BY SEASON*
Mobile Bay, 1954-1967

SEASON	Harvest in Thousands of Pounds Open Season	 Closed Season Due to Pollution
1967-68		798**
1966-67	2,297	
1965-66		751
1964-65		442
1963-64		1,339
1962-63	631	
1961-62		401
1960-61	799	
1959-60	1,225	
1958-59	555	
1957-58	571	
1956-57	1,270	
1955-56	847	
1954-55		1,760

Average Harvest = 1,024,000 #/year open season
915,000 #/year closed season

Net Loss in Harvest = 109,000 #/year = 10.7%

*This table was constructed from monthly harvest figures for Mobile and Baldwin Counties provided by the Bureau of Commercial Fisheries, New Orleans, Louisana.

**Covers July 1967 to March 1968.

TABLE VI

OYSTER HARVESTING VARIATION AS RELATED TO POLLUTION CLOSURES

Average Monthly Harvest
(in 1000 of Pounds)
(covers 1954-55 to 1966 to 1967 Period and July to February of 1968 Period)

Month	Average Mo. Harvest Open Periods	Average Mo. Harvest Closed Periods	Harvesting Loss	Percent Loss	Estimated Average Economic Loss* (due to pollution)
July	All closures in this month were for conservation purposes				
August	All closures in this month were for conservation purposes				
September	33	No closures occurred during this month			0
October	71	No closures occurred during this month			0
November	100	No closures occurred during this month			0
December	142	No closures occurred during this month			0
January	188	193	0	0	0
February	179	144	35		18,200
March	197	146	51		26,500
April	73	45	28		14,600
May	All closures in this month were for conservation purposes				
June	All closures in this month were for conservation purposes				

*Based on an average January 1969 as-landed price of $0.52 per pound.

Average annual shellfish harvests during the seasons with no pollution closures were 1,024,000 pounds. During seasons when closures were in effect, the average harvest was 915,000 pounds. Based on the average January 1969 price per pound as-landed of $0.52, the 109,000 pounds per year lost due to pollution closure had an average as-landed value of $56,700. These values indicate losses over a relatively long period of time, but do not consider differences in seasonal production. The landings data were broken down to describe monthly production over the 1954-55 to 1966-67 season period. Production values during closed and open months, and fractions thereof were determined.

Table VI shows average monthly oyster harvest values during open and closed periods over the period under study. An anomaly is observed for January where landings are greater during the closed period than the open period. This is attributed to the 1954-55 producing season when 525,000 lbs of oysters were harvested in January. Even though the beds were closed for over two weeks the production was so great that the closure effect upon production is apparently masked. The value is the highest January production over the period of study. The above values are generally considered as conservative since they deal with Mobile Bay as an entire unit. Closures, however, generally affect Mobile County oyster harvesters to a greater extent than Baldwin County harvesters since closures generally do not extend to Bon Secour Bay (in Baldwin County) which is a significant oyster producing area. Thus, when Mobile Bay is closed, only the Mobile County side is affected. (All of Mobile Bay, including Bon Secour Bay, was closed for the first time in 1968). When closures are applied, Mobile County oyster harvesters do not generally go to Bon Secour Bay to harvest, but may look to Portersville Bay as a source of oysters. Portersville Bay, while a productive area, is no substitute for the productive beds of lower Mobile Bay.

As shown in Table VI, the average monthly harvesting loss when closures are in effect can be quite substantial. The respective average harvesting losses during the months when pollution closures have been in effect are 35,000 pounds in February, 51,000 pounds in March, 28,000 pounds in April. The corresponding economic losses based on an as-landed value of $0.52 per pound averaged for January 1969 in Mobile and Baldwin Counties are $18,200 in February, $26,500 in March, and $14,600 in April.

The as-landed value of oysters reported by the Bureau of Commercial Fisheries is that amount received by harvesters. In a study conducted by Florida State University, it was indicated that the true value of oysters to the community under study, after processing and distribution, was about four times that amount.(9) Studies conducted by the Georgia Agricultural Experiment Station indicate that a multiple of 3.5 can be applied to oysters as-landed values to reflect retail values.(10) Thus, the total economic loss could be a factor of four greater than the loss based on the as-landed value and could conceivably approach $227,000 per year.

V. WASTE SOURCES

A. Municipal Wastes

Five municipalities - Chicksaw, Fairhope, Mobile, Prichard, and Saraland - have municipal sewerage systems including treatment plants. Chickasaw, with a lagoon-type treatment, and Fairhope and Saraland, each operating secondary plants, discharge into Chickasaw Creek, Mobile Bay, and Norton's Creek, respectively. Mobile operates five secondary plants discharging into Hall's Mill Creek, Eslava Creek, Mobile Bay (two plants), and Three Mile Creek. Prichard has two secondary plants, one discharging into Eight Mile Creek and the other discharging to Three Mile Creek. All plants except the lagoon serving Chickasaw are equipped with facilities for chlorinating treated wastes. Mobile's plant on Eslava Creek has reached its capacity and must be expanded for treating further increases in sewage from the area served by this plant.

The only portion of a municipal sewerage system in the basin from which untreated sewage is being discharged is the downtown area of Mobile. A project has been approved for these sewers to be intercepted and sewage routed to Mobile's McDuffie Island sewage treatment plant. Secondary sewage treatment will be installed for a privately-owned system serving Alabama Dry Docks on Blakely Island, now discharging untreated sewage into Mobile River. These two untreated sources serve approximately 7,000 people.

Privately-owned systems serving Spanish Fort Estates and Windsor Square in Baldwin County are equipped with secondary treatment plants discharging into D'Olive Creek and Blakely River. Searcy Hospital, a unit of the Alabama State Hospital system at Mt. Vernon, and Mobile College discharge sewage after secondary treatment through stabilization lagoons to Cedar Creek and Chickasaw Creek, respectively. There is a need for community sewage systems and treatment facilities in Bayou La Batre, Daphne, and Satsuma to replace septic tanks serving individual homes. There is a secondary sewage treatment plant serving Dauphin Island.

B. Industrial Wastes

The paper mills of International Paper Company and Scott Paper Company are the largest contributors of industrial wastes in the basin. Both dishcarge into the lower part of Chickasaw Creek adjacent to each other. Within the past few years, Scott Paper Company has constructed secondary treatment facilities while International Paper Company has provided primary treatment for its industrial waste since 1957. Domestic waste is treated in a septic tank. Scott Paper Company, however, operates the secondary facilities only in the summer and uses primary treatment during the remainder of the year. Half of the domestic wastes is treated with the industrial wastes and half is discharged into the municipal system. National Gypsum Company discharges wastes into Garrows Bend, Mobile Bay, without treatment and has been notified by the Alabama Water Improvement Commission that treatment will be required. Haas-Davis Packing Company was discharging untreated wastes from its meat processing plant into a branch a short distance from Three Mile Creek. This company has recently complied with the order of the Alabama Water Improvement Commission to arrange for the wastes to be treated through a municipal sewage treatment plant. Stone Container Corporation discharges waste into Three Mile Creek. Additional treatment is being required by the Alabama Water Improvement Commission to remove the color of this waste. Aluminum Company of America operates an essentially closed waste system for which water is returned to the plant for reuse following removal of solids in settling basins on Blakely Island. Seepage through the dikes of these basins and releases to avoid overflowing of the dikes during periods of heavy rainfall have, in the past, resulted in increases of alkalinity in Polecat Bay and a reddish color in waters of the Bay. The Alabama Water Improvement Commission has reported that improvements accomplished during 1967 eliminated the need for emergency releases from the basins and now provide for return of seepage to the basins.

Stauffer Chemical Company discharges wastes into Cold Creek under controlled conditions set by the Alabama Water Improvement Commission. Courtaulds North America discharges wastes into the Mobile River through an underwater diffuser near Twenty-Seven Mile Bluff, also under conditions established by the Commission.

Diamond Alkali Company discharges waste from a retention basin into the upper end of Hog Bayou, a tributary to Chickasaw Creek. Wastes from Linde Division of Union Carbide Corporation are discharged, after settling and blending, into the canal carrying the cooling water discharge from Alabama Power Company's Chickasaw steam plant, which in turn empties into Chickasaw Creek. Waste disposal practices of these two companies are considered to be adequate by the Alabama Water Improvement Commission.

American Bitumals Company's plant on Blakely Island is a potential source, but has reportedly maintained control over its oil-bearing wastes to avoid water pollution. Although Ruberoid Company discharges the major portion of its wastes into Mobile's sanitary sewerage system, part of the water used by the company reaches a ditch flowing into Woodcock Branch. At times in the past, this waste has contained material which imparted a white color to the water. The present status of this situation is undetermined, although complaints regarding colored waste have not been received for some time.

Over four years ago, waters along the Baldwin County shore of Mobile Bay were visibly affected by disturbance of the bottom of Mobile Bay by dredging for the removal of oyster shells. Such operations have been restricted to distances sufficiently far away from the shore to prevent interference with the quality of in-shore waters.

Data available in the files of the Alabama Water Improvement Commission show that gross pollution is occurring in Bayou La Batre as a result of the discharge of untreated wastes from several seafood processing plants in the area. Dissolved oxygen in the Bayou has been reported by the Commission to be zero, and a significant fish kill on June 30, 1967 was attributed to these wastes. Several smaller kills have been reported by the Commission. A partial listing of these plants in the Bayou La Batre area has been provided by the Alabama Water Improvement Commission and are: Bryant's Seafood Company, Inc.; Graham Seafood Company; Independent Seafood Company; Jerry's Seafood Company; Joe's Seafood Company, Inc.; Laforce Seafood Company; Lyons Seafood Company; Quality Foods, Inc.; Ramos Shrimp Company; Seafood Haven, Inc.; Seaman Fisheries, Inc.; Sea Pearl Seafood Company; Snake Bayou Seafood Company; Southland Shrimp Company; Steele Seafood Company; Stork Seafood Company; Water Front Seafood Company; and Horton Seafood Company.

In summary, the major organic waste producing industries not connected to the municipal system are International Paper Company; Scott Paper Company; Courtaulds North America, Incorporated; National Gypsum Company; and Stone Container Company. It is estimated that these industries discharge a total of approximately 116,000 pounds per day of five-day biochemical oxygen demand, a measure of organic concentration. On an organic demand basis, about 95% of the total waste discharges in the Mobile area are of industrial origin. None of the industrial waste sources employ chlorination or other means of disinfection. The domestic wastes produced by these industries generally receive septic tank treatment without chlorination.

Municipal and industrial waste sources are summarized in Table VII.(11)

TABLE VII

WASTE SOURCES

MOBILE RIVER AND MOBILE BAY

Location	Treatment	Flow (MGD)	Year Constructed	Receiving Stream
A) Municipal Waste				
Chickasaw	Lagoon	0.80	1964	Chickasaw Cr.
Dauphin Is.	Secondary-Chlorination	0.15	1957	Bay Aloe
Fairhope	Secondary-Chlorination	0.35	1950	Mobile Bay
Mobile				
1) McDuffie	Secondary-Chlorination	6.50	1958	Mobile Bay
2) Eslava Cr.	Secondary-Chlorination	4.00	1954	Eslava Cr.
3) Halls Mill Cr.	Secondary-Chlorination	0.50	1963	Halls Mill Cr.
4) Bill Ziebach	Secondary-Chlorination	0.50	1966	Mobile Bay
5) Three Mile Cr.	Secondary-Chlorination	5.50	1964	Three Mile Cr.
6) River Front	None	0.90		Mobile Bay
Prichard				
1) Grover St.	Secondary-Chlorination	2.00	1968	Three Mile Cr.
2) Eight Mile Cr.	Secondary-Chlorination	1.00	1962	Eight Mile Cr.
Saraland	Secondary-Chlorination	0.10	1963	Norton Branch

TABLE VII - CONT'D

WASTE SOURCES

MOBILE RIVER AND MOBILE BAY

Location	Treatment Sewage	 Industrial	Flow (MGD)	Receiving Stream
B) Industrial Waste				
American Bituminals	Septic Tank	Oil Recovery	1.05	Mobile R.
Courtaulds	Imhoff	Screening	6.14	Mobile R.
Diamond Alkali	Septic Tank	Storage Basins	0.30	Chickasaw C.
Haas Davis Packing	Municipal System		0.28	Three Mile C.
International Paper	Septic Tank	Settling Tank	31.73	Chickasaw C.
Scott Paper	Half to Munic. System Half to Indus. Wastes	Secondary(summer) Primary (winter)	59.74	Chickasaw C.
Nat'l. Gypsum Co.	Septic Tank	Primary	1.00	Mobile B.
Union Carbide - Linde Division	Septic Tank	Primary	0.60	Chickasaw C.
Stone Container Corp.	--	--	0.40	Three Mile Cr

VI. WATER QUALITY

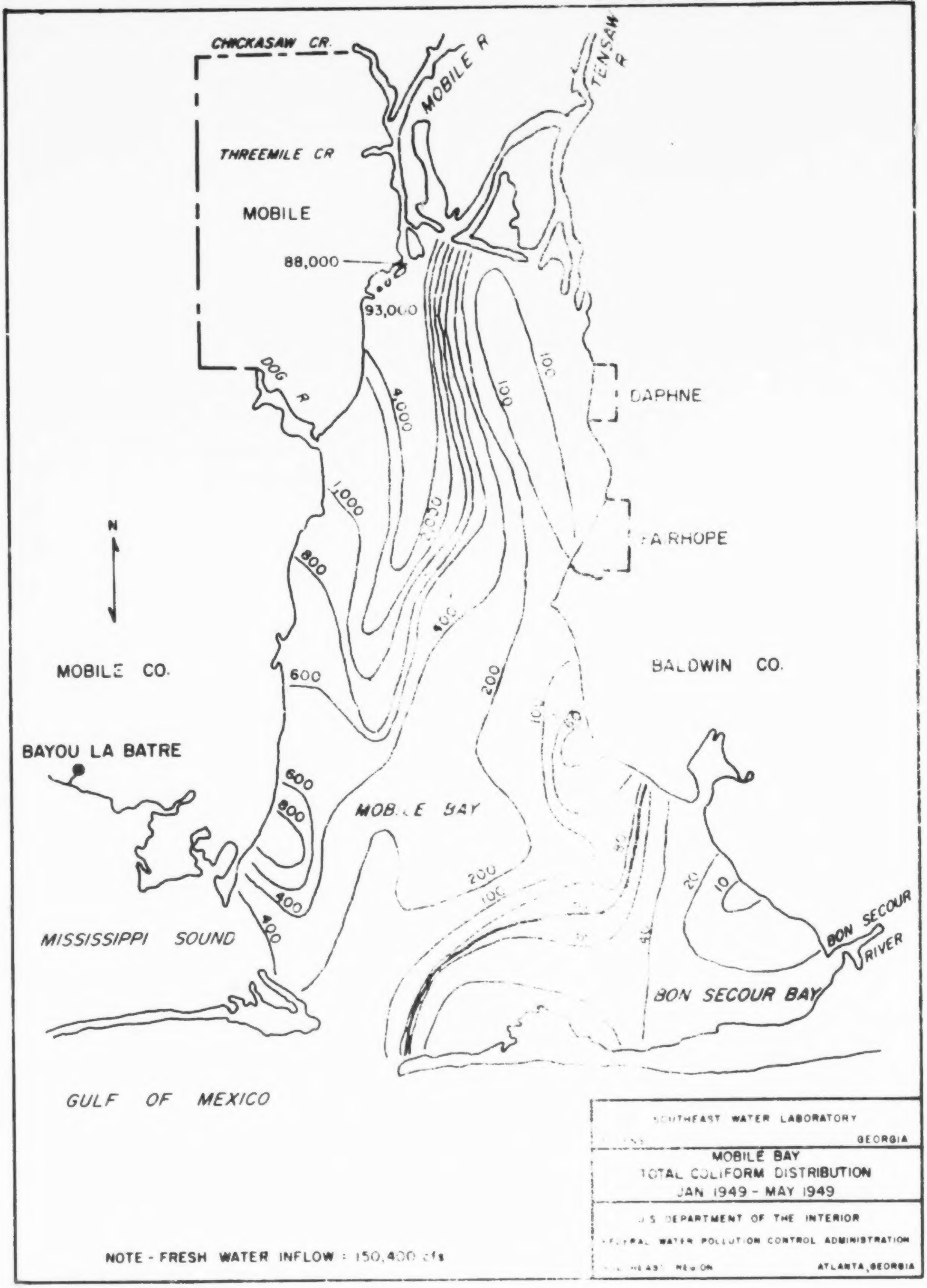
The major damage to water use in Mobile Bay caused by poor water quality is curtailment of shellfish harvesting during the winter and early spring months due to bacterial concentrations, specifically coliform organisms which exceed the level recommended by the U. S. Public Health Service and adopted as a standard by the State of Alabama. The coliform organisms have traditionally been used as indicators of pollution and of the possible presence of pathogens due to the difficulty of isolating the pathogens themselves. A major reservation associated with the use of the total number of coliform organisms as an indicator is that one of the principal species, Aerobacter aerogenes, has been shown to be ubiquitous and not necessarily confined to situations where there are identifiable pollutional discharges. In 1961, a laboratory procedure was devised for the separation of the coliform group into its environmental source components those of fecal orgin and non-fecal origin. The fecal coliform group is representative of the coliforms associated with warmblooded animal excreta.(12) Therefore, the fecal coliform group is a more direct indicator than total coliform of relatively recent fecal pollution.

Coliform data in Mobile Bay and in the Mobile River above and below Mobile have been collected on a periodic basis since 1949, primarily during flood flow into the Bay when the shellfish beds are usually closed. Data have been evaluated for 1949, 1950, 1961, 1962 and 1967. All data except for 1967 were collected by the Alabama

Water Improvement Commission. The 1967 data were reported by the Southeastern Comprehensive Water Pollution Control Project of FWPCA. The 1949 and 1950 data represented conditions during which no treatment of wastes was provided at Mobile. The 1961-62 data are representative of an intermediate condition during which some sewage treatment, both domestic and industrial, was operating. The 1967 data were collected when all of the domestic wastes from Mobile and adjacent areas except 0.9 million gallons per day (MGD) out of 22.2 MGD were treated and chlorinated.

Figures 4 and 5 represent total coliform data collected from January to May, 1949, and January to March, 1950. These dates roughly encompass the high flow runoff periods for those years. Combined flows in the Alabama and Tombigbee Rivers averaged 150,400 cubic feet per second (cfs) in 1949 and 110,600 cfs during 1950. Total coliform concentrations in the Mobile River above waste sources at Mobile had a median value of 430/100 ml during the 1949 period. There are no known major waste sources of bacteriological pollution above this point. In the Mobile River channel at the lower end of Pinto Island just above the Bay and below waste sources, total coliform densities were 11,000/100 ml, a 26-fold increase. The Tensaw River, the other major tributary at the head of Mobile Bay, had a median density of 240/100 ml at the mouth. There are no significant sources of organic wastes on the Tensaw River. Lines of equal coliform concentrations in the Bay (isolines) indicate that there is a "tongue" effect generally conforming to the channel area with increased lateral dispersion as longitudinal distance down the Bay increases.

FIGURE 4


CHICKASAW CR.
MOBILE R
TENSAW R
THREEMILE CR
MOBILE
88,000
93,000
DOG R
4,000
1,000
2,000
800
600
400
200
100
40
20
10
DAPHNE
FAIRHOPE
N
MOBILE CO.
BALDWIN CO.
BAYOU LA BATRE
MOBILE BAY
MISSISSIPPI SOUND
BON SECOUR RIVER
BON SECOUR BAY
GULF OF MEXICO

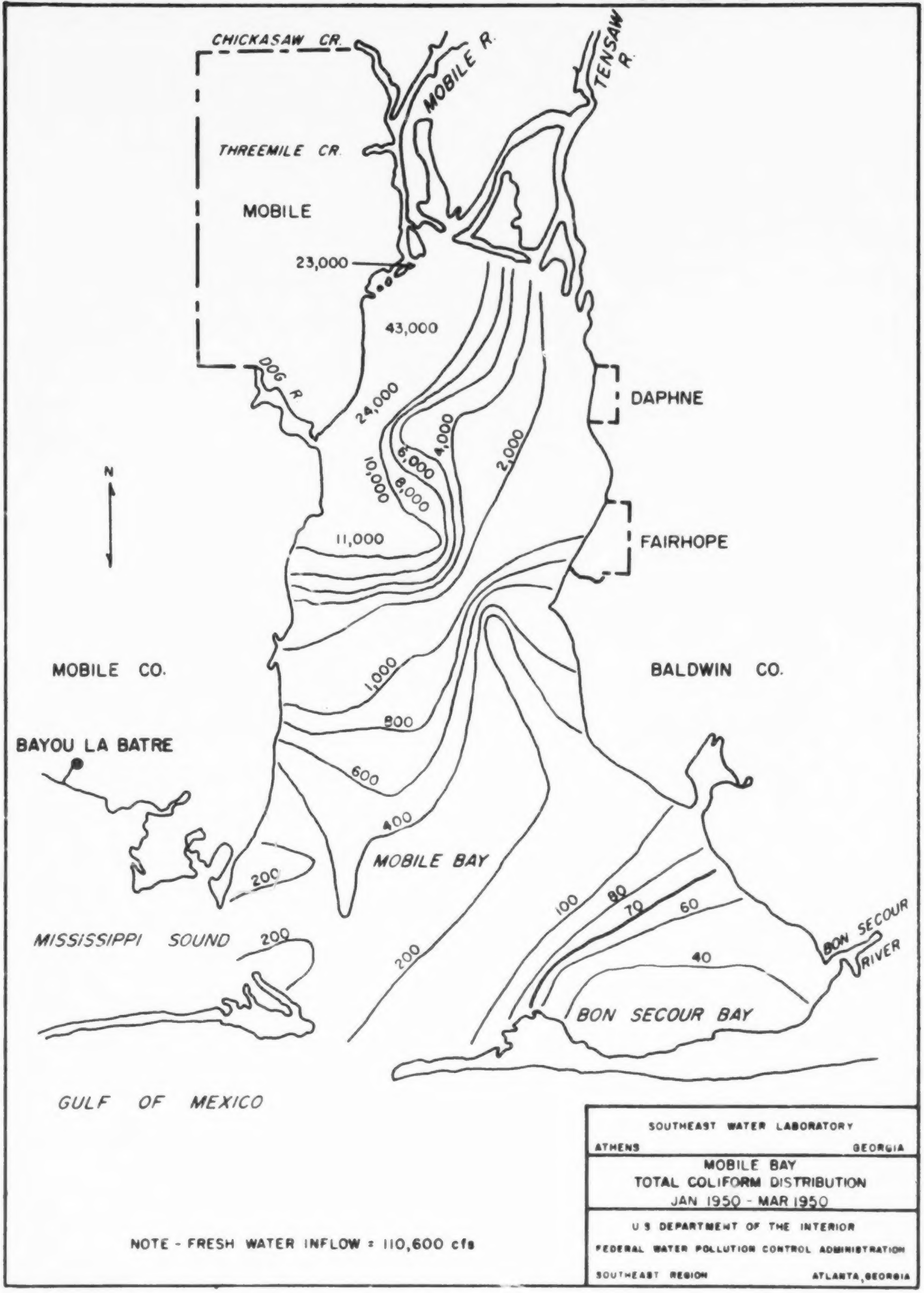
SOUTHEAST WATER LABORATORY
ATHENS GEORGIA

MOBILE BAY
TOTAL COLIFORM DISTRIBUTION
JAN 1949 - MAY 1949

U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
SOUTHEAST REGION ATLANTA, GEORGIA

NOTE - FRESH WATER INFLOW : 150,400 cfs

FIGURE 5


CHICKASAW CR.
MOBILE R.
TENSAW R.
THREEMILE CR.
MOBILE
23,000
43,000
DOG R.
24,000
10,000
6,000
4,000
8,000
2,000
DAPHNE
FAIRHOPE
N
11,000
MOBILE CO.
BALDWIN CO.
1,000
800
BAYOU LA BATRE
600
400
MOBILE BAY
200
MISSISSIPPI SOUND
200
200
100
80
70
60
40
BON SECOUR RIVER
BON SECOUR BAY
GULF OF MEXICO

SOUTHEAST WATER LABORATORY
ATHENS GEORGIA

MOBILE BAY
TOTAL COLIFORM DISTRIBUTION
JAN 1950 - MAR 1950

U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
SOUTHEAST REGION ATLANTA, GEORGIA

NOTE - FRESH WATER INFLOW = 110,600 cfs

Densities in the approved shellfish areas ranged from about 200/100 ml to 1,000/100 ml. Median concentrations in the entire Bay exceeded 70/100 ml except for a portion of Bon Secour Bay. There was, however, an unusual distribution of coliform in the area offshore of Mon Louis Island in the vicinity of some of the most active shellfishing areas. This anomaly cannot be explained in terms of a regular dieaway or dilution of waste resulting from the Mobile River and may indicate a possible additional source of coliform. There are no significant waste sources in the immediate area to account for this phenomenon.

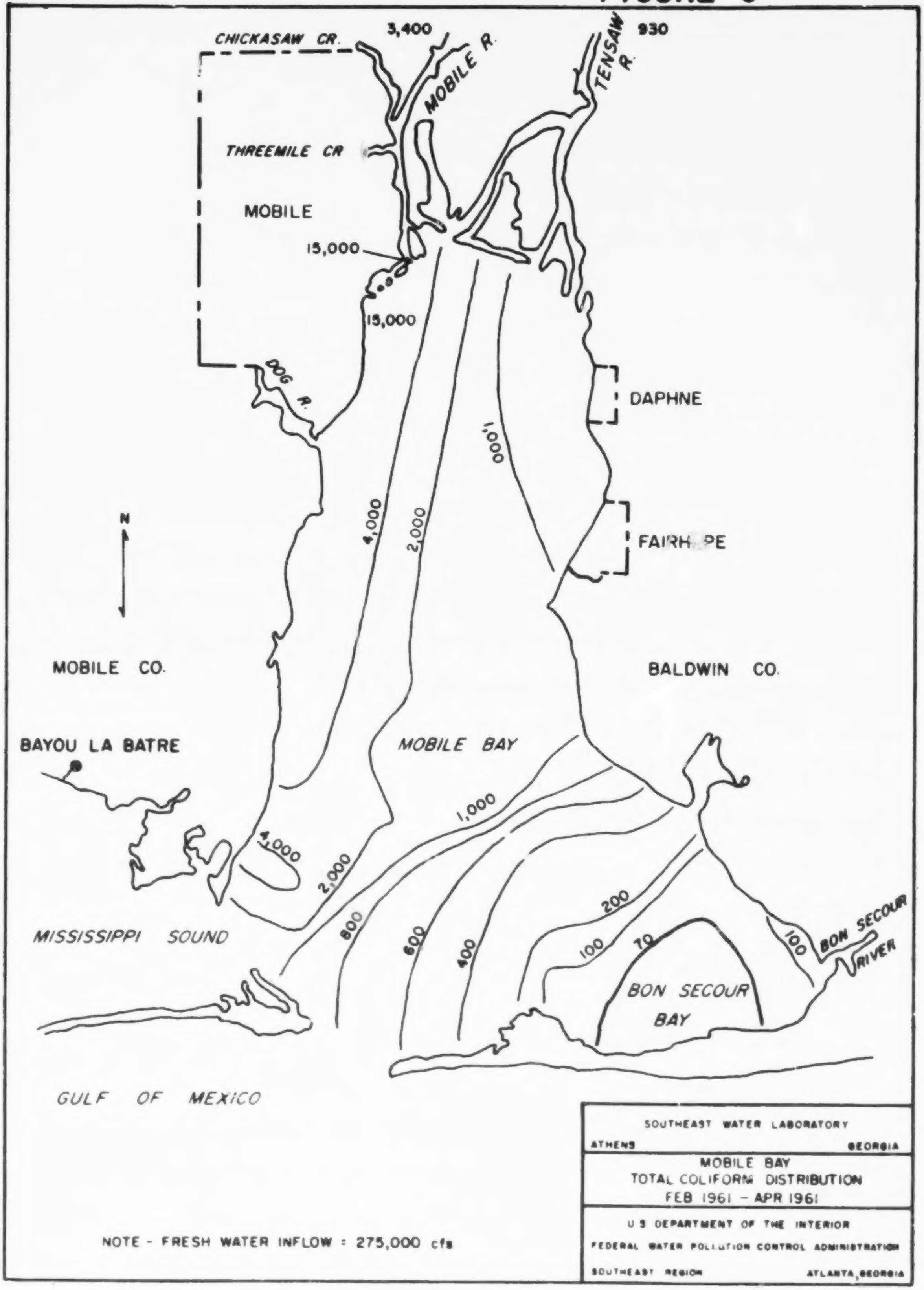
During the high flow period of 1950, the median density above Mobile in the Mobile River was 750/100 ml. Below Mobile, at the mouth of the River, the density had increased to 23,000/100 ml, or 31 times greater. The concentration in the Tensaw River during this period was 430/100 ml. As in 1949, the pattern of coliform concentration in Mobile Bay showed high densities inflowing from the Mobile River and generally demonstrated a distribution of the highest values in the channel and along the western shore to a point south of the Dog River. Median densities of as high as 43,000/100 ml were observed. Below this point, there was a sharp decrease. However, concentrations in the shellfish areas again ranged from about 200/100 ml to 1,000/100 ml. Fresh water flow during this period averaged about 73% of the previous year high runoff.

From mid-February to mid-April, 1961, the flood runoff to the Mobile River from the Alabama and Tombigbee Rivers averaged 275,000 cfs, a record. Total coliform density in the Mobile River from above to below the Mobile area increased over four times from 3,400/100 ml to 15,000/100 ml. Median density in the Tensaw River was 930/100 ml.

At this time, secondary treatment and chlorination had been applied to 62% of the total domestic wastes. Again, the highest concentrations were in the channel and along the western shore of the Bay. Densities in the shellfishing areas ranged from approximately 800/100 ml to 4,000/100 ml. The same unusual distribution off the southern end of Mon Louis Island was again apparent as in the 1949 data. Total coliform densities in this area were about 4,000/100 ml. Fecal coliform medians exhibited the same general distribution pattern. Densities increased over four times in the Mobile River from above to below Mobile. The respective concentrations were 330/100 ml and 1,370/100 ml. The corresponding density in the Tensaw River was 93/100 ml. Fecal densities in the shellfishing areas ranged from 80/100 ml to 300/100 ml. A concentration of 7.8/100 ml was exceeded in all sections of Mobile Bay and Bon Secour Bay. Total and fecal coliform distributions are shown in Figures 6 and 7.

From late December, 1961, to late April, 1962, the mean combined flow of the Alabama and Tombigbee Rivers was about 165,000 cfs. Total coliform medians increased sixteen times from 9,300/100 ml below the confluence of the Alabama and Tombigbee Rivers in the Mobile River to 150,000/100 ml at the mouth. Fecal coliform medians for the same points increased two and one-half times from 930/100 ml to 2,300/100 ml. Total and fecal medians in the Tensaw River were 4,300/100 ml and 430/100 ml, respectively. Isolines indicated the same distribution pattern as the previously discussed data, including the anomalous concentrations off Mon Louis Island for both total and fecal coliforms. Densities in this area were 4,000/100 ml for total coliform and

FIGURE 6


CHICKASAW CR.
3,400
MOBILE R.
TENSAW R.
930
THREEMILE CR
MOBILE
15,000
15,000
DOG R.
DAPHNE
1,000
4,000
2,000
FAIRHOPE
N
MOBILE CO.
BALDWIN CO.
BAYOU LA BATRE
MOBILE BAY
1,000
4,000
2,000
800
600
400
200
100
70
100
BON SECOUR RIVER
MISSISSIPPI SOUND
BON SECOUR BAY
GULF OF MEXICO

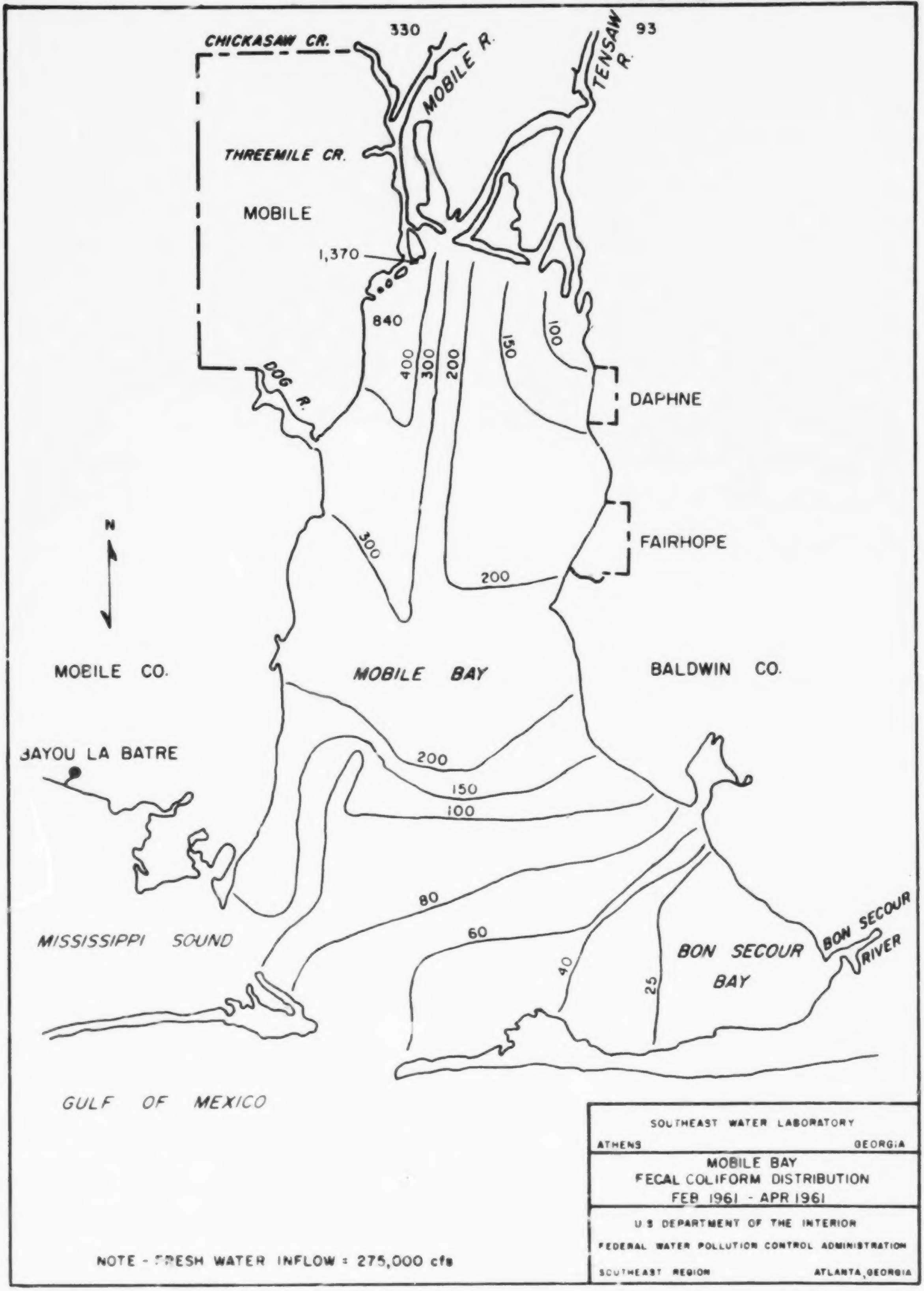
SOUTHEAST WATER LABORATORY
ATHENS GEORGIA

MOBILE BAY
TOTAL COLIFORM DISTRIBUTION
FEB 1961 - APR 1961

U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
SOUTHEAST REGION ATLANTA, GEORGIA

NOTE - FRESH WATER INFLOW = 275,000 cfs

FIGURE 7


CHICKASAW CR.
330
MOBILE R.
TENSAW R.
93
THREEMILE CR.
MOBILE
1,370
840
400
300
200
150
100
DOG R.
DAPHNE
N
300
FAIRHOPE
200
MOBILE CO.
MOBILE BAY
BALDWIN CO.
BAYOU LA BATRE
200
150
100
80
60
40
25
MISSISSIPPI SOUND
BON SECOUR BAY
BON SECOUR RIVER
GULF OF MEXICO

SOUTHEAST WATER LABORATORY
ATHENS GEORGIA

MOBILE BAY
FECAL COLIFORM DISTRIBUTION
FEB 1961 - APR 1961

U.S DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
SOUTHEAST REGION ATLANTA, GEORGIA

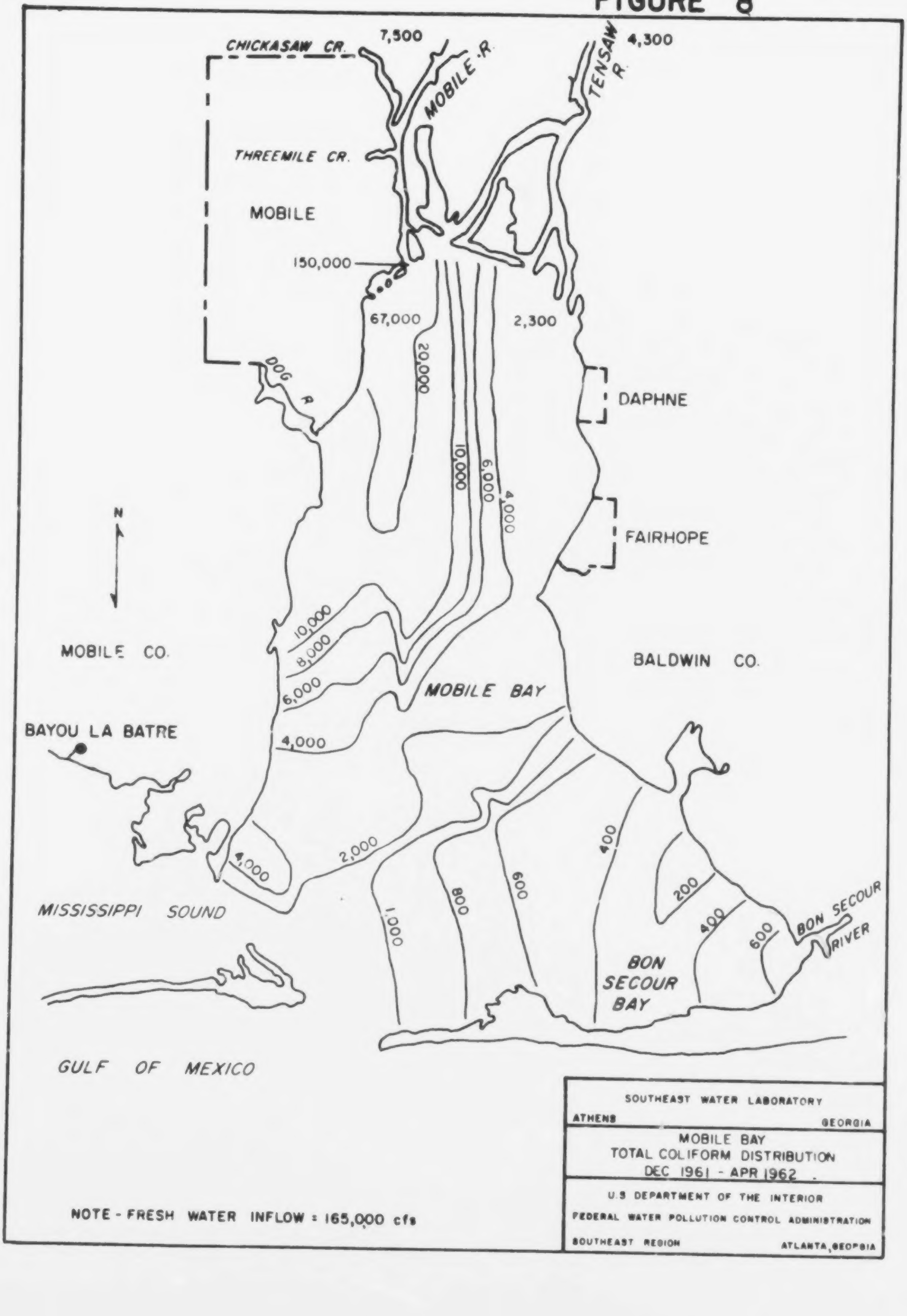
NOTE - FRESH WATER INFLOW = 275,000 cfs

approximately 100/100 ml for fecal coliform. Total and fecal coliform distributions are shown in Figures 8 and 9.

From December, 1966, to March, 1967, the average flood flow in the Mobile River approximated 73,500 cfs. Coliform concentrations remained relatively constant at several points in the Mobile River, from river mile (RM) 44.5 to RM 7, having median values ranging between 3,300/100 ml and 4,900/100 ml total coliform and 90/100 ml to 460/100 ml fecal coliform. In the Mobile River immediately above Chickasaw Creek, total and fecal coliform median densities were 3,300/100 ml and 90/100 ml, respectively. Below Chickasaw Creek and above Three Mile Creek, the respective total and fecal coliform densities were 6,400/100 ml and 490/100 ml. Waste discharges into Chickasaw Creek and its tributaries, Eight Mile Creek and Hog Bayou, include the unchlorinated domestic effluent from the lagoons serving Mobile College and Chickasaw; chlorinated effluent from Prichard; and the primary treated effluents from Scott Paper Company, International Paper Company, and Diamond Alkali Company. Below Three Mile Creek, total and fecal coliform had increased to 13,200/100 ml and 1,400/100 ml . Three Mile Creek at this time was receiving untreated wastes from the Haas Davis Packing Company, chlorinated waste from Mobile, and primary treated, unchlorinated waste from Prichard. Haas Davis has recently connected to the Mobile sewer system. The section of the Mobile River from below Three Mile Creek to the mouth receives untreated waste from the downtown area and from the Alabama State Docks. At the mouth of the Mobile River, the total coliform median was approximately 29,500/100 ml and the fecal coliform median was 1,400/100 ml. This represents an eight-fold increase for total coliform and a nearly five-fold increase for fecal coliform from above to below the Mobile area. Total coliform medians in the Tensaw River were 4,900/100 ml at RM 40.7 and 2,300/100 ml at RM 11.5. Fecal coliform medians for the same points were 330/100 ml and 80/100 ml, respectively. Median total and fecal coliform densities at the mouth of Polecat Bay were 3,600/100 ml and 120/100 ml, respectively. Distribution in the Bay was as described previously. Data was not collected below a line south of Fairhope. Total coliform medians exceeded 2,000 per 100 ml and fecal coliform had a median of 100 per 100 ml along this line. The distributions of total and fecal coliform during the period are shown in Figures 10 and 11.

Coliform distribution in the Bay was evaluated during a low flow period to determine the relative effect of high flood inflows. From August to November, 1962, the average flow of the Alabama and Tombigbee Rivers to the Mobile River was 14,300 cfs. Under these flow conditions, total coliform medians increased in the Mobile River from above to below Mobile from 430/100 ml to 9,300/100 ml. Fecal coliform medians increased from 21/100 ml to 2,300/100 ml. This represents a 22-fold increase for total coliform and a 110-fold increase for fecal coliform. Isolines in the Bay showed a similar distribution of coliform as at high flow but with a less well pronounced "tongue" effect. In addition, the concentrations appear to disperse more regularly and the net direction is the center of the Bay, rather than along the western shore as in the high flow periods. There is also a sharper decrease with longitudinal distance down the Bay. With respect to the 70/100 ml standard, total coliform concentrations were acceptable

FIGURE 8


CHICKASAW CR.
7,500
MOBILE R.
TENSAW R.
4,300
THREEMILE CR.
MOBILE
150,000
67,000
20,000
2,300
DOG R.
DAPHNE
10,000
6,000
4,000
FAIRHOPE
N
MOBILE CO.
BALDWIN CO.
10,000
8,000
6,000
MOBILE BAY
BAYOU LA BATRE
4,000
2,000
4,000
400
200
400
600
BON SECOUR RIVER
1,000
800
600
MISSISSIPPI SOUND
BON SECOUR BAY
GULF OF MEXICO

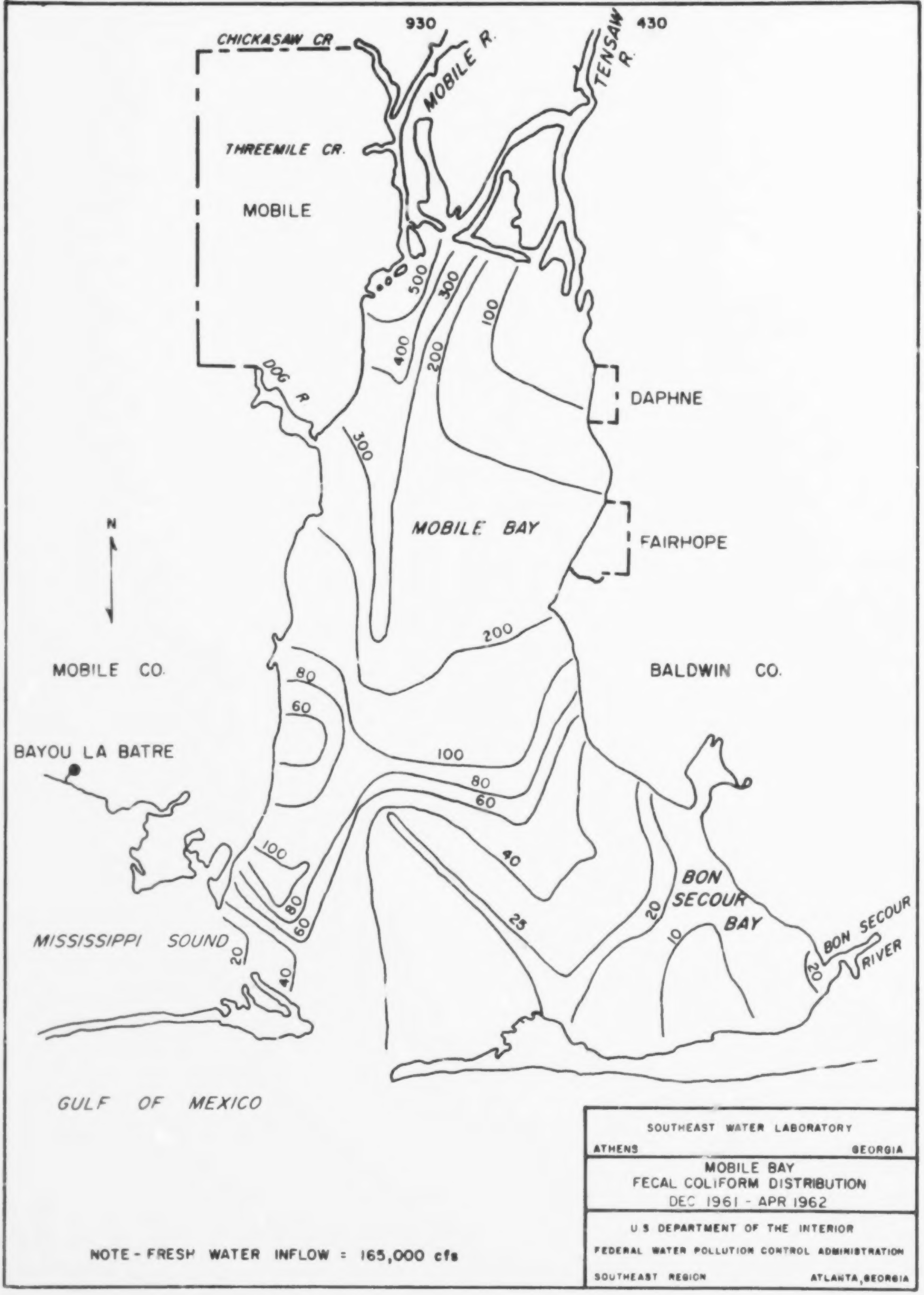
NOTE - FRESH WATER INFLOW = 165,000 cfs

SOUTHEAST WATER LABORATORY
ATHENS GEORGIA

MOBILE BAY
TOTAL COLIFORM DISTRIBUTION
DEC 1961 - APR 1962

U.S DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
SOUTHEAST REGION ATLANTA, GEORGIA

FIGURE 9


930
430
CHICKASAW CR
MOBILE R.
TENSAW R.
THREEMILE CR.
MOBILE
500
300
100
400
200
DOG R
DAPHNE
300
N
MOBILE BAY
FAIRHOPE
200
MOBILE CO.
BALDWIN CO.
80
60
BAYOU LA BATRE
100
80
60
100
40
80
60
BON SECOUR BAY
20
25
10
MISSISSIPPI SOUND
20
40
BON SECOUR RIVER
20
GULF OF MEXICO

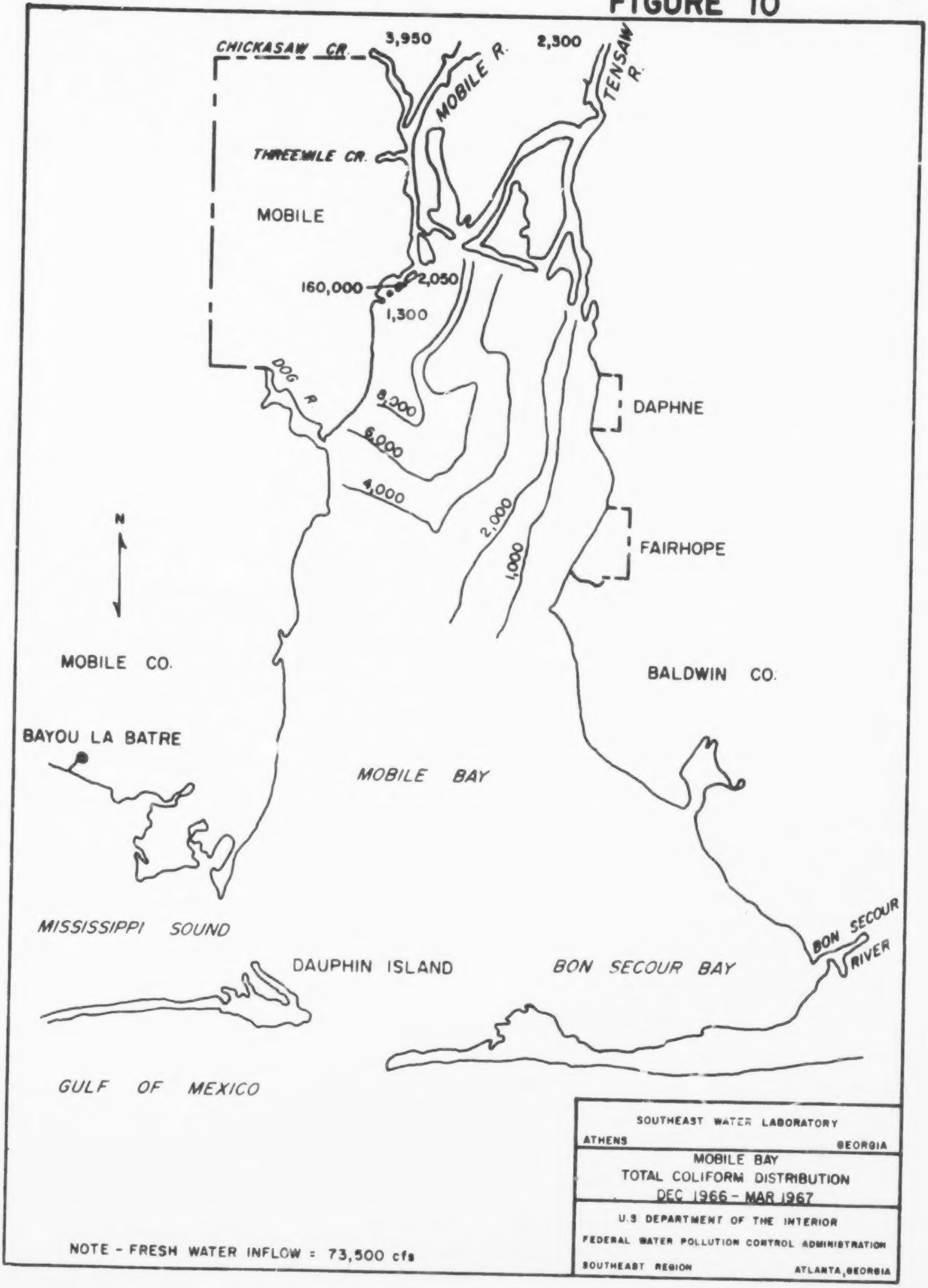
SOUTHEAST WATER LABORATORY
ATHENS GEORGIA

MOBILE BAY
FECAL COLIFORM DISTRIBUTION
DEC 1961 - APR 1962

U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
SOUTHEAST REGION ATLANTA, GEORGIA

NOTE - FRESH WATER INFLOW = 165,000 cfs

FIGURE 10


CHICKASAW CR.
3,950
MOBILE R.
2,300
TENSAW R.
THREEMILE CR.
MOBILE
160,000
2,050
1,300
DOG R.
8,000
6,000
4,000
2,000
1,000
DAPHNE
FAIRHOPE
N
MOBILE CO.
BALDWIN CO.
BAYOU LA BATRE
MOBILE BAY
MISSISSIPPI SOUND
DAUPHIN ISLAND
BON SECOUR BAY
BON SECOUR RIVER
GULF OF MEXICO

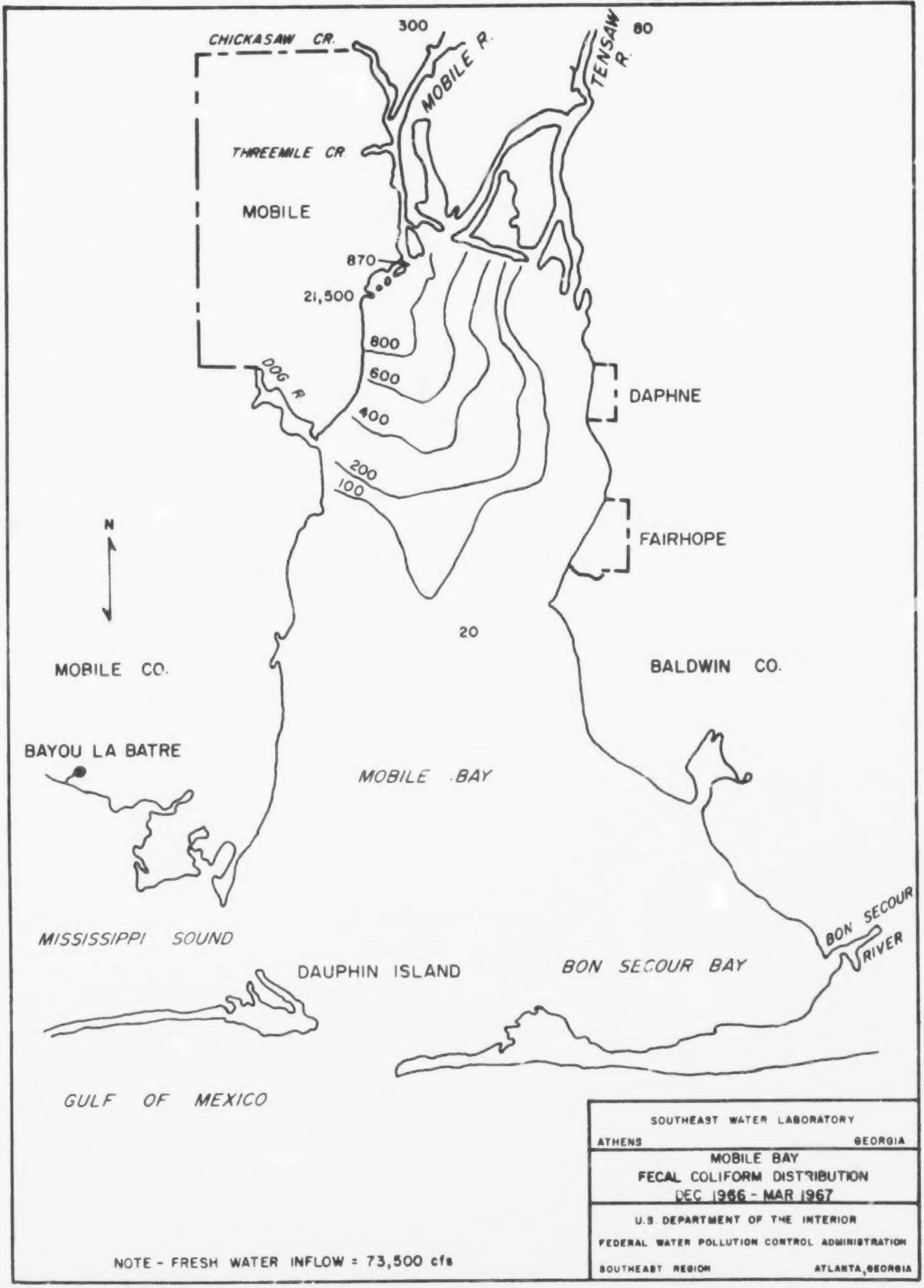
SOUTHEAST WATER LABORATORY
ATHENS GEORGIA

MOBILE BAY
TOTAL COLIFORM DISTRIBUTION
DEC 1966 - MAR 1967

U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
SOUTHEAST REGION ATLANTA, GEORGIA

NOTE - FRESH WATER INFLOW = 73,500 cfs

FIGURE 11


CHICKASAW CR.
300
MOBILE R.
TENSAW R.
80
THREEMILE CR.
MOBILE
870
21,500
800
600
400
200
100
DOG R.
DAPHNE
FAIRHOPE
N
20
MOBILE CO.
BALDWIN CO.
BAYOU LA BATRE
MOBILE BAY
MISSISSIPPI SOUND
DAUPHIN ISLAND
BON SECOUR BAY
BON SECOUR RIVER
GULF OF MEXICO

SOUTHEAST WATER LABORATORY
ATHENS GEORGIA

MOBILE BAY
FECAL COLIFORM DISTRIBUTION
DEC 1966 - MAR 1967

U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
SOUTHEAST REGION ATLANTA, GEORGIA

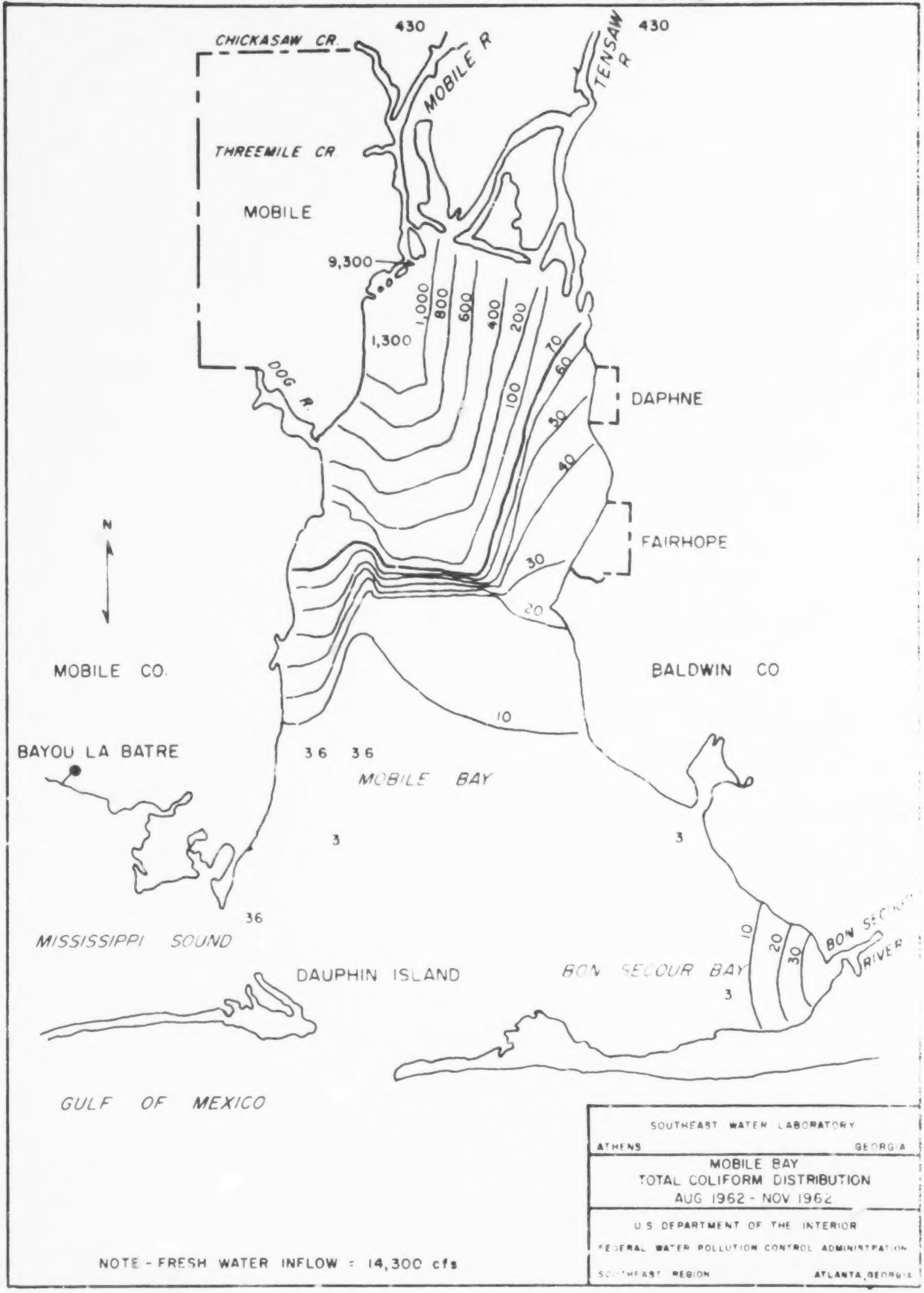
NOTE - FRESH WATER INFLOW = 73,500 cfs

for shellfishing all along the eastern shore of the Bay and along the western shore below a line extending from south of Fairhope. Figures 12 and 13 illustrate the low flow total and fecal coliform distributions.

There are certain conclusions which may be drawn from consideration of these data concerning the excessive coliform densities in Mobile Bay. Table VIII summarizes the median coliform densities in the Mobile and Tensaw Rivers. The Mobile River is overwhelmingly the single most significant source of coliform pollution to Mobile Bay. The Tensaw River, the other major tributary, consistently has shown coliform concentrations at the mouth to be five to 53 times less than those of Mobile River at its mouth. In the Mobile River, during high flood runoff and at a time when sewage treatment and chlorination were being provided for a majority of the domestic wastes in the Mobile metropolitan area, 77 to 95 per cent of the total coliform and 60 to 79 per cent of the fecal coliform entering Mobile Bay was contributed from above to below Mobile. When no treatment or disinfection was provided, 96 to 97 per cent of the total coliform pollution was contributed from above to below Mobile during high flow periods. During the low flow period examined, the Mobile area contribution represented 95.5 per cent of the total coliform and 99 per cent of the fecal coliform in the Mobile River at the mouth.

It is apparent that, although there has been some improvement due to treatment and disinfection of municipal waste sources, there are still significant increases in coliform pollution, both total and fecal, from above to below the Mobile metropolitan area. Approximately 117 MGD of domestic and industrial wastes are discharged into the

FIGURE 12


CHICKASAW CR.
430
MOBILE R
TENSAW R
430
THREEMILE CR.
MOBILE
9,300
1,300
1,000
800
600
400
200
100
70
60
50
40
30
20
10
DOG R.
DAPHNE
FAIRHOPE
N
MOBILE CO.
BALDWIN CO
BAYOU LA BATRE
3.6
3.6
MOBILE BAY
3
3
36
MISSISSIPPI SOUND
DAUPHIN ISLAND
BON SECOUR BAY
3
10
20
30
BON SECOUR RIVER
GULF OF MEXICO

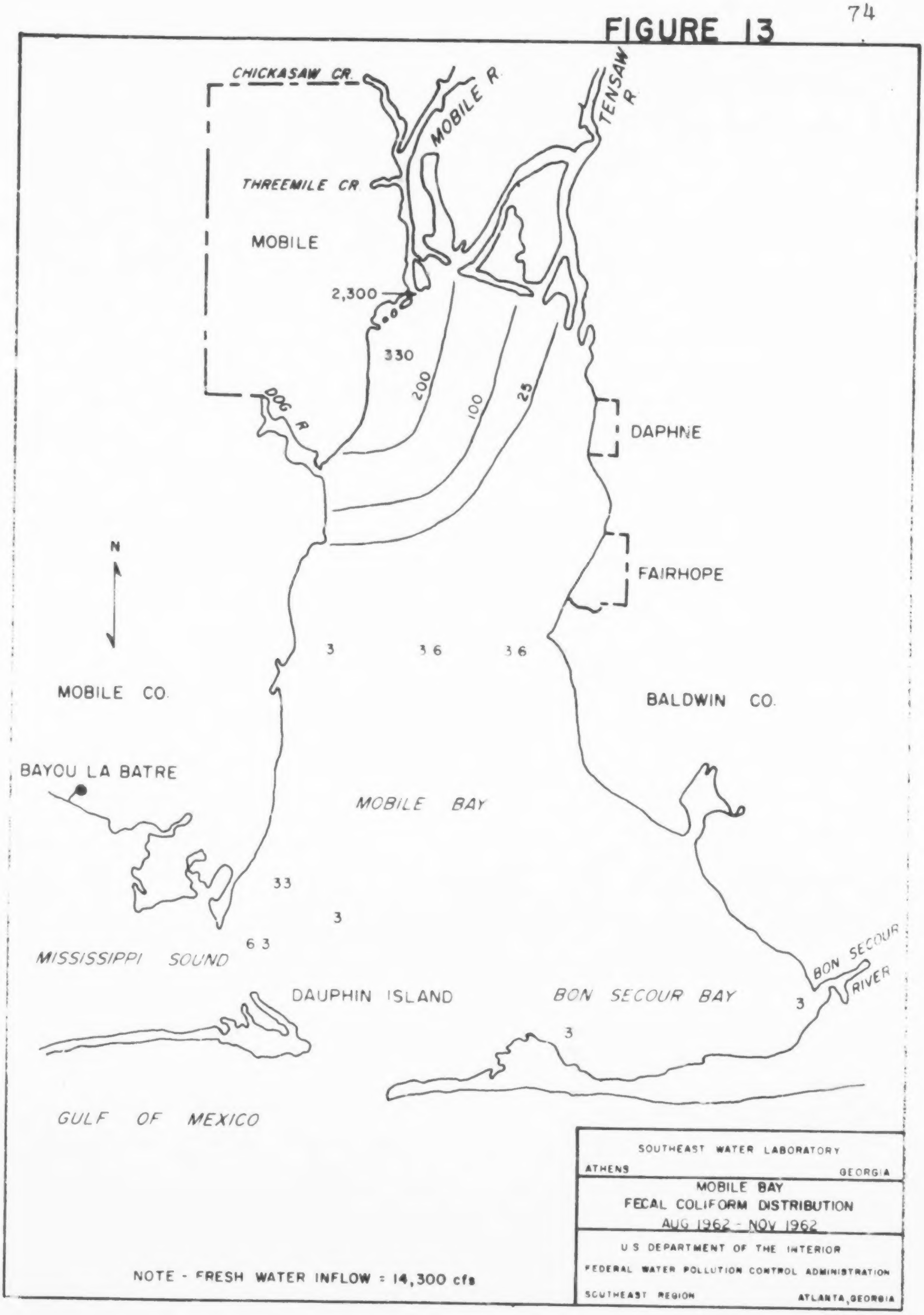
SOUTHEAST WATER LABORATORY
ATHENS GEORGIA

MOBILE BAY
TOTAL COLIFORM DISTRIBUTION
AUG 1962 - NOV 1962

U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
SOUTHEAST REGION ATLANTA, GEORGIA

NOTE - FRESH WATER INFLOW = 14,300 cfs

FIGURE 13


CHICKASAW CR.
MOBILE R.
TENSAW R.
THREEMILE CR.
MOBILE
2,300
330
200
100
25
DOG R
DAPHNE
FAIRHOPE
N
3
36
36
MOBILE CO.
BALDWIN CO.
BAYOU LA BATRE
MOBILE BAY
33
3
63
MISSISSIPPI SOUND
DAUPHIN ISLAND
BON SECOUR BAY
BON SECOUR RIVER
3
3
GULF OF MEXICO

SOUTHEAST WATER LABORATORY
ATHENS GEORGIA

MOBILE BAY
FECAL COLIFORM DISTRIBUTION
AUG 1962 - NOV 1962

U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
SOUTHEAST REGION ATLANTA, GEORGIA

NOTE - FRESH WATER INFLOW = 14,300 cfs

Station	Location	
Oyster Bed Sampling Stations - East of Dauphin Island Causeway		
	Latitude	Longitude
D5	30° 18.43'	88° 08.02'
D6	30° 18.20'	88° 07.89'
D7	30° 18.02'	88° 07.56'
D8	30° 17.84'	88° 07.85'
D9	30° 17.88'	88° 07.73'

TABLE VIII

MEDIAN COLIFORM DENSITIES - MOBILE AND TENSAW RIVERS

Period	Mobile R. Flow (cfs)	Above Mobile Total Coliform mpn/100ml	Above Mobile Fecal Coliform mpn/100ml	Below Mobile Total Coliform mpn/100ml	Below Mobile Fecal Coliform mpn/100ml	% Increase Total	% Increase Fecal	Tensaw River Total Coliform mpn/100ml	Tensaw River Fecal Coliform mpn/100ml
Jan.-May 1949	150,400	430	-	11,000	-	2,600	-	240	-
Jan.-March 1950	110,600	750	-	23,000	-	3,100	-	430	-
Feb.-April 1961	275,000	3,400	330	15,000	1,370	440	415	930	93
Dec.-April 1962	165,000	9,300	930	150,000	2,300	1,600	250	4,300	430
Dec.-March 1967	73,500	3,800	300	29,500	1,400	780	470	2,300	80
Aug.-Nov. 1962	14,300	430	21	9,300	2,300	2,160	11,000	-	-

Mobile River and tributaries. Of this total, about 80 per cent on a flow basis represents organic industrial wastes which are known to generally produce high total coliform concentrations. In fact, considering organic demand as the criterion, industrial wastes discharged amount to 95 per cent of the total. At high flows, waste loads are carried along the western shore of the Bay and reach the shellfishing areas before dieoff or dilution decreases the bacterial concentrations to acceptable levels. At the present time, concentrations during high flow periods are many times greater than the 70/100 ml median total coliform required for approved shellfish harvesting.

Studies by the Alabama Water Improvement Commission indicate that during high fresh water flows waters entering the Bay follow the western shore on a direct route to the oyster producing areas. The Commission has demonstrated that coliform densities increase as flow increases in the Alabama and Tombigbee Rivers. Data collected in the Tombigbee River near Leroy and the Alabama River near Claiborne continuously from 1960 to 1962 show that there is an imprecise direct correlation between flow and coliform concentrations, both total and fecal. As flow increases, coliform densities also increase. Therefore, at high flows, coliform densities throughout the bay will be higher irrespective of waste sources in the Mobile vicinity.

If the coliform contribution contributed at Mobile during high flow (77 to 95 per cent of total coliform and 60 to 79 per cent of fecal coliform in the Mobile River entering Mobile Bay) were removed and all other conditions remained constant; viz. same input from tributaries, same dieaway and dilution characteristics, it is probable that, because of the direct correlation between coliform and fresh water flow, coliform densities would exceed the 70/100 ml standard for shellfish harvesting during high flow periods in all sections of Mobile Bay except Bon Secour Bay. Under these circumstances, total coliform densities in the shellfishing areas would probably be between 200 and 400/100 ml. Fecal coliform, however, would most likely not exceed 25/100 ml. It should be emphasized that this represents only a judgmental extrapolation based on certain assumptions and could only be directly demonstrated after reduction or elimination of Mobile's pollution load (see projected concentrations at oyster beds). If a fecal coliform criterion is applied in determining acceptability for shellfish harvesting, removal of the fecal coliform contributed from above to below the Mobile metropolitan area will be necessary.

Methods for the detection of pathogenic organisms have, until recently, been too complicated for use in field determinations. There are now refined qualitative methods which makes possible the isolation of the genus Salmonella, one of the most common enteric pathogens, in a relatively convenient manner which is adaptable to field survey procedures. It is, therefore, recommended that any control program to more effectively evaluate acceptability of waters in Mobile Bay for shellfishing use, should equally emphasize: 1) a sanitary survey to delineate possible sources of pollution, 2) effective disinfection of all waste sources which may affect the area, and 3) use of fecal coliform as a primary monitoring device in conjunction with Salmonella determinations to more effectively evaluate the probability of pathogen presence.

VII. Bacteriological Source Survey

To define the bacteriological contribution of wastes from sources in the Mobile area, the Federal Water Pollution Control Administration and the Alabama Water Improvement Commission conducted a field survey during January-February 1969. The objectives of this survey were: to identify sources of total and fecal coliform in the Mobile metropolitan area, including storm water runoff, and to evaluate the relative contribution of each source and; to determine whether currents in Mobile Bay could transport pollutants from the Mobile area to oyster beds in the lower Bay. This survey involved sampling for both quality and flow of twelve municipal and industrial effluents as well as the sewer outfalls of the section of Mobile discharging untreated wastes. Storm water analyses were also made. Coliform sampling of the Mobile River as well as the major tributaries of the river and Mobile Bay was included. A limited study of the current pattern in Mobile Bay was performed.

A) Sampling Procedure

The domestic waste sources sampled included: Threemile Creek, Halls Mill Creek, Bill Ziebach, McDuffie Island and Eslava Creek sewage treatment plants of the city of Mobile. Other domestic waste sources sampled were the two Prichard sewage treatment plants and the Chickasaw waste lagoon. Sampling was also conducted at the following industrial waste sources: International Paper Company, Scott Paper Company, National Gypsum Corporation and Stone Container Corporation. Significant point sources of pollution were not found on Blakely Island and there was negligible discharge from the Alabama State Docks due to the Atlantic and Gulf coast port strike. Samples were collected from sanitary sewers at the intersections of Commerce and Conti Streets and Water and St. Michael Streets to characterize the contribution from the untreated section of Mobile. The total untreated sewage flow was estimated from figures and calculations contained in a design memorandum from David Volkert Associates to the city of Mobile. Storm water contribution was characterized by samples collected at the Southern Drain, Onemile Creek and the Big Stikney Drain. These points drain about 1700 acres, or approximately one-third of the developed portion of Mobile. The Southern Drain discharges near the mouth of the Mobile River and Onemile Creek and Big Stikney discharge to Threemile Creek.

In the receiving waters, samples were collected at five locations in the Mobile River; the Louisville and Nashville railroad bridge above sources of waste, below Chickasaw Creek, below Threemile Creek, above the untreated section of Mobile and at the mouth of the river between McDuffie Island and Pinto Island. Analyses were made at quarter points and at the surface and 20 foot depths in the Mobile River. Points above and below sources of waste on Chickasaw Creek, Eightmile Creek, Threemile Creek, Eslava Creek, Halls Mill Creek and the Dog River were established. Coliform concentrations at the oyster beds were also determined.

An FWPCA mobile laboratory was located at the McDuffie Island sewage treatment plant. All samples were processed within six hours of collection. For the point sources of waste, samples were collected every hour and composited every four hours for a 24-hour period. Daily samples were taken for six days in the Mobile River and six samples were taken from each tributary station. Collections were made from the sanitary sewers at three-hour intervals from 8:00 AM to 6:00 PM and at four-hour intervals from 8:00 PM to 6:00 AM for one 24-hour period. Four storm water samples were collected on two occasions from each location after rainfall and storm runoff had begun. All preservations and analyses were performed according to procedures enumerated in the twelfth edition of Standard Methods for the Analysis of Water and Wastewater. The multiple tube most probable number technique was used exclusively for total and fecal coliform. All sources of waste and sampling locations are shown in Figure 14 and Appendix E.

B) Hydrology and Current Study

During the survey, the average combined flow of the Alabama and Tombigbee Rivers was 137,220 cfs. Measurements of velocity and cross sectional area showed that approximately 36,000 cfs was flowing in the Mobile River itself. All flows are summarized in Table IX and are based on individual measurements.

Although weather was not favorable for the operation of small craft on Mobile Bay, a limited current study was made on February 4-5, 1969. A synoptic profile of the velocity and direction of water at the surface and at the 10-foot depth was obtained as closely as possible to the time of ebb slack current. Total fresh water inflow to the Bay during this period ranged from 84,000 to 110,000 cfs. The tides were lower than predicted due to a strong north wind. These low tides combined with the increasing flows from the river system would produce a stronger than expected movement of fresh waste down

FIGURE 14

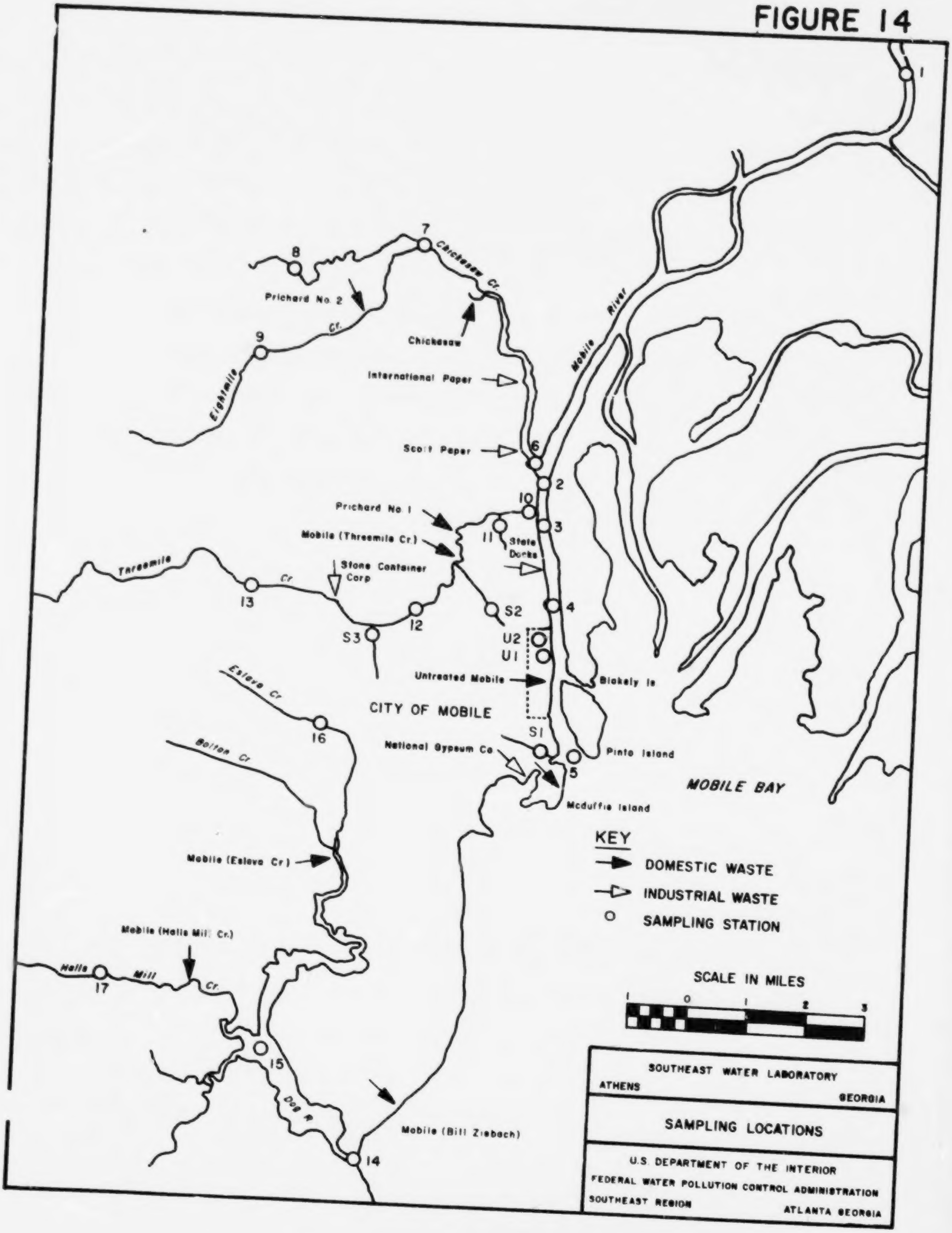

1
7
Chickasaw Cr
8
Prichard No. 2
Chickasaw
9
Eightmile
Cr.
Mobile River
International Paper
Scott Paper
6
2
10
Prichard No. 1
3
11
State Docks
Mobile (Threemile Cr.)
Threemile
Stone Container Corp
Cr
13
12
S2
4
S3
U2
U1
Untreated Mobile
Blakely Is
Eslava Cr
CITY OF MOBILE
16
Bolton Cr
S1
National Gypsum Co
Pinto Island
5
MOBILE BAY
Mcduffie Island
Mobile (Eslava Cr.)
KEY
DOMESTIC WASTE
INDUSTRIAL WASTE
SAMPLING STATION
Mobile (Halls Mill Cr.)
Halls
Mill
Cr.
17
SCALE IN MILES
1
0
1
2
3
15
Dog R
Mobile (Bill Ziebach)
14
SOUTHEAST WATER LABORATORY
ATHENS
GEORGIA
SAMPLING LOCATIONS
U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
SOUTHEAST REGION
ATLANTA GEORGIA

TABLE IX

Average River Flows

Mobile Area

February 1969

Waterway	Average Flow (cfs)
Alabama & Tombigbee Rivers	137,220*
Mobile River at Mobile	36,000
Chickasaw Creek	155 *
Eightmile Creek	46
Threemile Creek	14
Halls Mill Creek	43
Eslava Creek	4

*U. S. G. S. measurement - preliminary and subject to revision.

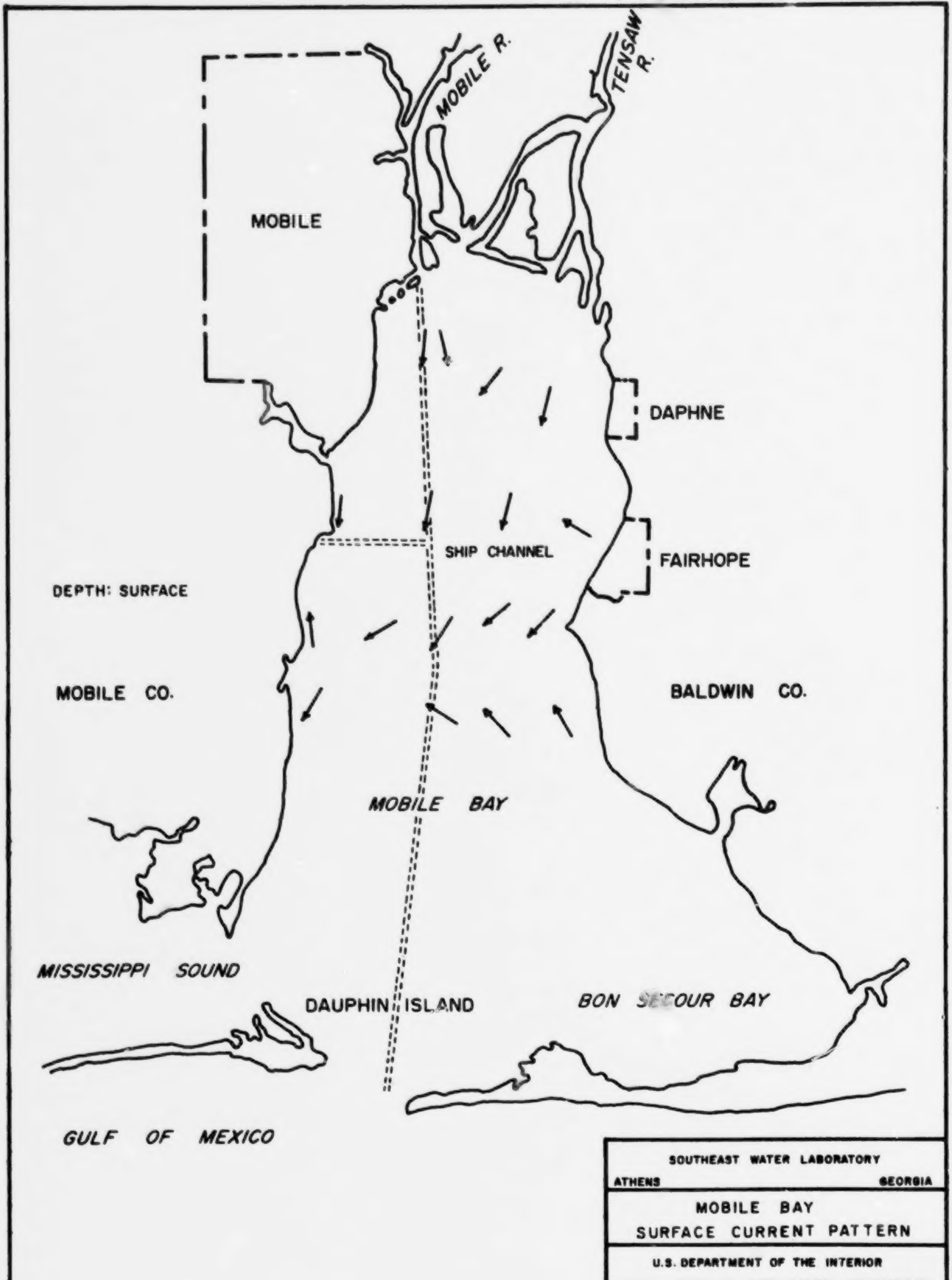
the Bay. The current profiles are shown in Figures 15 and 16.

These current profiles confirm the distribution demonstrated by the coliform isolines from previous surveys in Mobile Bay. Surface water tends to move down the western side of the Bay from both the Mobile and Tensaw Rivers on both tidal currents. The magnitude of the velocity of net movement is directly dependent upon the quantity of freshwater inflow. Although the observed velocities are not the maximums that occur, the maximum slack velocity was 0.9 miles per hour at the surface in the ship channel. At this velocity, it would be possible for water from the Mobile River to reach the shellfish beds in about one day's time of travel.

Currents on the bottom of the upper Bay are variable and generally weaker except in the ship channel. Tidal currents predominated only at depths greater than the natural depth, such as in the ship channel. A saltwater wedge did exist in the channel as far as the mouth of Chickasaw Creek during flood current. The interface between fresh and saltwater was between 15 and 20 feet deep off McDuffie Island and 25 to 30 feet at Chickasaw Creek.

The currents in the lower Bay below Great Point Clear are variable but tidal dependent. Surface water exhibits a net counter-clockwise movement because of the combination of flood tides entering the Bay from Mississippi Sound and the Gulf of Mexico, and the freshwater inflow from the Mobile River system. These conditions, combined with the natural Coriolis effect in estuaries, accentuate the movement of water down the Bay in the direction of and along the western shore.

FIGURE 15

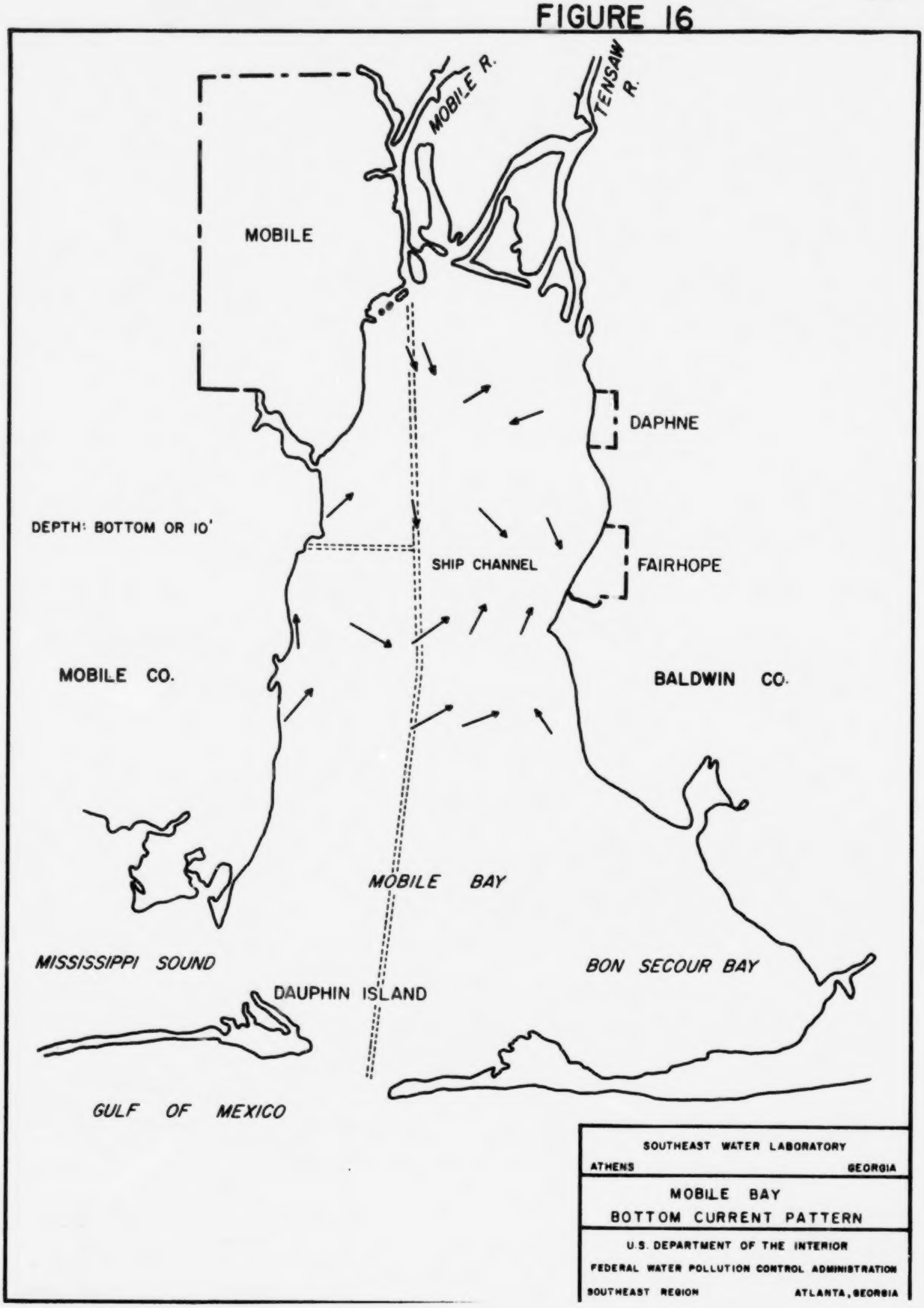

MOBILE R.
TENSAW R.
MOBILE
DAPHNE
SHIP CHANNEL
FAIRHOPE
DEPTH: SURFACE
MOBILE CO.
BALDWIN CO.
MOBILE BAY
MISSISSIPPI SOUND
DAUPHIN ISLAND
BON SECOUR BAY
GULF OF MEXICO

SOUTHEAST WATER LABORATORY
ATHENS GEORGIA

MOBILE BAY
SURFACE CURRENT PATTERN

U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
SOUTHEAST REGION ATLANTA, GEORGIA

FIGURE 16


MOBILE R.
TENSAW R.
MOBILE
DAPHNE
DEPTH: BOTTOM OR 10'
SHIP CHANNEL
FAIRHOPE
MOBILE CO.
BALDWIN CO.
MOBILE BAY
MISSISSIPPI SOUND
BON SECOUR BAY
DAUPHIN ISLAND
GULF OF MEXICO

SOUTHEAST WATER LABORATORY
ATHENS GEORGIA

MOBILE BAY
BOTTOM CURRENT PATTERN

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FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
SOUTHEAST REGION ATLANTA, GEORGIA

C) Effluent Evaluation

To permit comparison of the relative significance of each of the waste inputs, coliform concentrations were converted to bacterial population equivalents (BPE) according to the following relationship:(1

$$BPE = Q\ (cfs) \times MPN/100\ ml \times 1.94 \times 10^{-4} \qquad ($$

Although this relationship was derived for total coliform only, the fecal coliform observations have also been converted to BPE for purposes of comparison. The median values for each point source of waste are shown in Table X.

There is no significant bacteriological pollution being discharg from the Halls Mill Creek, Bill Ziebach and McDuffie Island sewage treatment plants of the city of Mobile or from the two Prichard installations. Concentrations of total coliform, however, indicate that closer attention to proper operation may be necessary at Mobile's Halls Mill Creek plant (28,450/100 ml) and possibly at Prichard's Threemile Creek plant (2700/100 ml). The other three domestic waste sources - Mobile's Threemile Creek and Eslava Creek plants and Chickasaw's lagoon - are discharging excessive concentrations of both total and fecal coliform. Chickasaw does not have disinfection faciliti and the effluent total and fecal coliform were 1,100,000/100 ml and 330,000/100 ml, respectively. The Eslava Creek plant is heavily overloaded and consequently treatment efficiencies are less than desirable. The relative total and fecal concentrations were 2,400,000/100 ml and 1,595,000/100 ml. Respectively the Threemile Creek plant is Mobile's second largest, discharging 6.5 MGD. Bacterial disinfection was not effective at this plant during the survey. Effluent concentrations of

TABLE X

BACTERIAL WASTE SOURCES

Waste Sources	*Flow MGD	Median Coliform Concentrations MPN/100 ml		Bacterial Population Equivalent		% Total Contribution from Mobile	
		Total	Fecal	Total	Fecal	Total	Fecal
Domestic-Mobile							
Halls Mill Creek STP	0.26	28,450	120	2	0	0	0
Threemile Creek STP	6.48	960,500	41,950	1,870	80	1.6	0.3
Bill Ziebach STP	0.27	600	125	0	0	0	0
McDuffie I. STP	6.68	490	35	1	0	0	0
Eslava Creek STP	4.3	2,400,000	1,595,000	3100	2,060	2.6	7.1
Prichard							
Threemile Creek STP	1.88	2,700	435	2	0	0	0
Eightmile Creek STP	0.79	80	20	0	0	0	0
Chickasaw							
Chickasaw Lagoon	1.09	1,100,000	330,000	360	110	0.3	0.4
Industrial							
Stone Container Corp.	0.41	3,500,000	505,000	430	60	0.4	0.2
National Gypsum Co.	1.12	16,000,000	6,350,000	5390	2140	4.6	7.4
Scott Paper Co.	62.8	230,000	54,000	4340	1020	3.7	3.5
International Paper Co.	34.4	5,400,000	945,000	55,900	9,780	47.4	33.8
Untreated Section of Mobile	2.12	73,000,000	21,450,000	46,500	13,700	39.4	47.3

*Average during study period.

total and fecal coliform were 960,500/100 ml and 41,950/100 ml. On a mass basis, these three sources discharge 5,330 BPE of total coliform and 2,250 BPE of fecal coliform. These quantities represent 4.5% of the total coliform discharged from point sources of waste and 7.8% of the fecal coliform.

All of the industrial waste sources were discharging significant concentrations of both total and fecal coliform. The largest contributor on a mass basis is the International Paper Company, with a median total coliform discharge of 55,900 BPE and 9,780 BPE of fecal coliform and 5,400,000/100 ml and 945,000/100 ml, respectively. Bacteriological pollution discharged from this installation represented 47.4% of the total coliform and 33.8% of the fecal coliform from all sources investigated. As listed previously, International Paper Company provides primary treatment only for the industrial waste and a septic tank for the domestic waste. The total waste discharge is about 34 MGD. The average temperature of the effluent was 39°C, which is reasonably close to the optimum growth temperature range for both total and fecal coliform. It is possible that the industrial process is acting as an incubator mechanism and causing multiplication of total and fecal coliform.

The other industrial waste sources in order of quantity of bacteria discharged are the National Gypsum Company, Scott Paper Company and Stone Container Corporation. National Gypsum Company had concentrations of total and fecal coliform from three to six times greater than any of the other sources at 16,000,000/100 ml and 6,350,000/100 ml, respectively. Scott Paper Company had the lowest concentrations at 230,000/100 ml and 54,000/100 ml, respectively. However, Scott discharges flume water which is relatively low in coliform with process water, thereby diluting concentrations and lowering the temperature to below that for optimum growth rates. In addition, Scott's water intake is located in Chickasaw Creek upstream from the severely polluted reach, whereas International Paper's intake is located in the heavily polluted reach. Thus, Scott discharged only about one-thirteenth of the quantity of coliform as International Paper.

The four industrial sources sampled contribute 56.1% of the total coliform and 44.9% of the fecal coliform. All of the plants had inadequate treatment for both domestic and industrial wastes. For the most part, they provide septic tanks and primary treatment, respectively. Scott was providing primary treatment for a mixture of domestic and industrial wastes. Nearly 66,060 BPE of total coliform and 13,000 BPE of fecal coliform are discharged collectively by these sources.

The second greatest single source of coliform pollution in Mobile metropolitan area is the untreated section of Mobile. Concentrations of total and fecal coliform had medians of 73,000,000/100 ml and 21,450,000/100 ml. An estimated quantity of 46,500 BPE of total coliform and 13,700 BPE of fecal coliform is discharged. These figures represent 39.4% of all of the total coliform and 47.3% of the fecal coliform. Currently an interceptor sewer is being built to transport these wastes to the McDuffie Island plant for treatment.

The thirteen point sources of pollution sampled in the Mobile metropolitan area discharge more than 117,900 BPE of total coliform and 28,950 BPE of fecal coliform. Under present treatment plans, it is estimated that this total will be reduced by approximately half within the next two years due to the interception of downtown Mobile sewage. At that time, if present operating conditions continue, it is estimated that the industrial sources will contribute 92% of the total coliform and 85% of the fecal coliform discharged. An abatement program is required which provides for secondary treatment and effective disinfection for all sanitary wastes. Operation of all waste abatement facilities should be at the highest possible removal efficiencies at all times. The Eslava Creek sewage treatment plant should be upgraded as soon as possible and the effluent from the Chickasaw lagoon should be chlorinated. Operating improvements should be made at Mobile's Threemile Creek plant. All industries should completely separate their process and domestic wastes and provide immediate secondary treatment and chlorination or connection to the municipal sewerage system for the latter. Secondary treatment should also be provided for all process wastes. If a total or fecal coliform standard for shellfish is employed, these process wastes should receive effective disinfection.

The contribution of coliform pollution from storm water was examined during two rainstorms on February 6 and 8, 1969. The total rainfall on both days was 0.08 inches and 0.28 inches, respectively. Although these totals do not represent an intense rain, the storms, particularly the second one, were characterized by a series of short heavy downpours. Only one sample was collected during the second storm. The results of these analyses are shown in Table XI. Runoff was estimated using the rational formula:

TABLE XI

Storm Water Coliform Pollution

Storm Drain	c	Drainage Area (acres)	Q (cfs)	Median Coliform Conc. Total	Median Coliform Conc. Fecal	B.P.E.* Total	B.P.E.* Fecal
				MPN/100 ml			
Storm of 2/6/69							
Southern Drain	0.425	510	5.0	330,000	49,000	320	47
Big Stikney	0.40	547	5.0	330,000	110,000	322	107
Onemile Creek	0.58	640	8.5	3,300,000	3,300,000	5,430	5,430
Storm of 2/8/69							
Southern Drain	0.425	510	6.7	1,100,000	170,000	1,430	223
Big Stikney	0.40	547	6.8	940,000	170,000	1,240	225
Onemile Creek	0.58	640	11.5	35,000,000	13,000,000	78,000	29,000

*Bacterial Population Equivalent

$$Q = c \cdot i \cdot a \qquad (2)$$

where Q = runoff in cfs

c = runoff coefficient

i = rainfall intensity in inches/hour

a = drainage area in acres

It is hypothesized that there must be a source of waste on Onemile Creek to produce the excessive concentrations shown. Therefore, consideration was limited to an evaluation of the Southern and Big Stikney drains only. The second storm had about 3.5 times more quantity of rainfall and about four times more total coliform and three times more fecal coliform than the first storm. The two drainage areas under consideration constitute about 16% of the developed area in Mobile. If the figures were extrapolated to the city, approximately 3,970 BPE of total coliform and 985 BPE of fecal coliform would have been discharged during the first storm. The second storm would have produced 16,850 BPE and 2,860 BPE or total and fecal coliform, respectively. These figures do not include the built up areas of Prichard and Chickasaw. During these relatively light rainfalls, the storm water coliform contribution from Mobile alone approximated 3-14% of the contribution from point sources of pollution. More intense rainfall would produce a greater percentage. During the periods of time that they occur, storm water overflows are significant sources of coliform pollution in the Mobile metropolitan area.

D) River and Tributary Evaluation

Daily samples from the Mobile River were collected for bacterial analyses on February 4-10, 1969. Samples were not collected on February 6, 1969 due to a rainstorm. The bacterial concentrations in the river on February 5 were disregarded in the evaluation because they were significantly lower than all other values, indicating that conditions in the river on February 5 were not representative of conditions during the remainder of the survey. The average temperature in the Mobile River was 12^{o}C during the study.

The background bacterial concentration in the Mobile River system was determined at the L & N Railroad Bridge (Sta. 1), 15.5 miles above the mouth of the river. The median total coliform concentration was 11,000 MPN/100 ml and the fecal coliform concentration was 4,600 MPN/100 ml. The median total and fecal coliform concentrations in the Mobile River are presented in Table XII and Figures 17, 18 and 19. The surface coliform concentrations at the Highway 90-98 Bridge (Sta. 2) in the center of the channel were considerably reduced from the values at the L & N bridge. Since it was observed that waste entering the river from Chickasaw Creek, which is just upstream from this location, was not thoroughly mixed through the cross section and there are no known waste sources above the station, the reduction in bacterial concentration was presumed due to natural dieoff. The effects of pollution from Chickasaw Creek were evident at the west-quarter point. The median total coliform concentration was 19,500 MPN/100 ml, which was the highest concentration observed in the Mobile River during

FIGURE 17

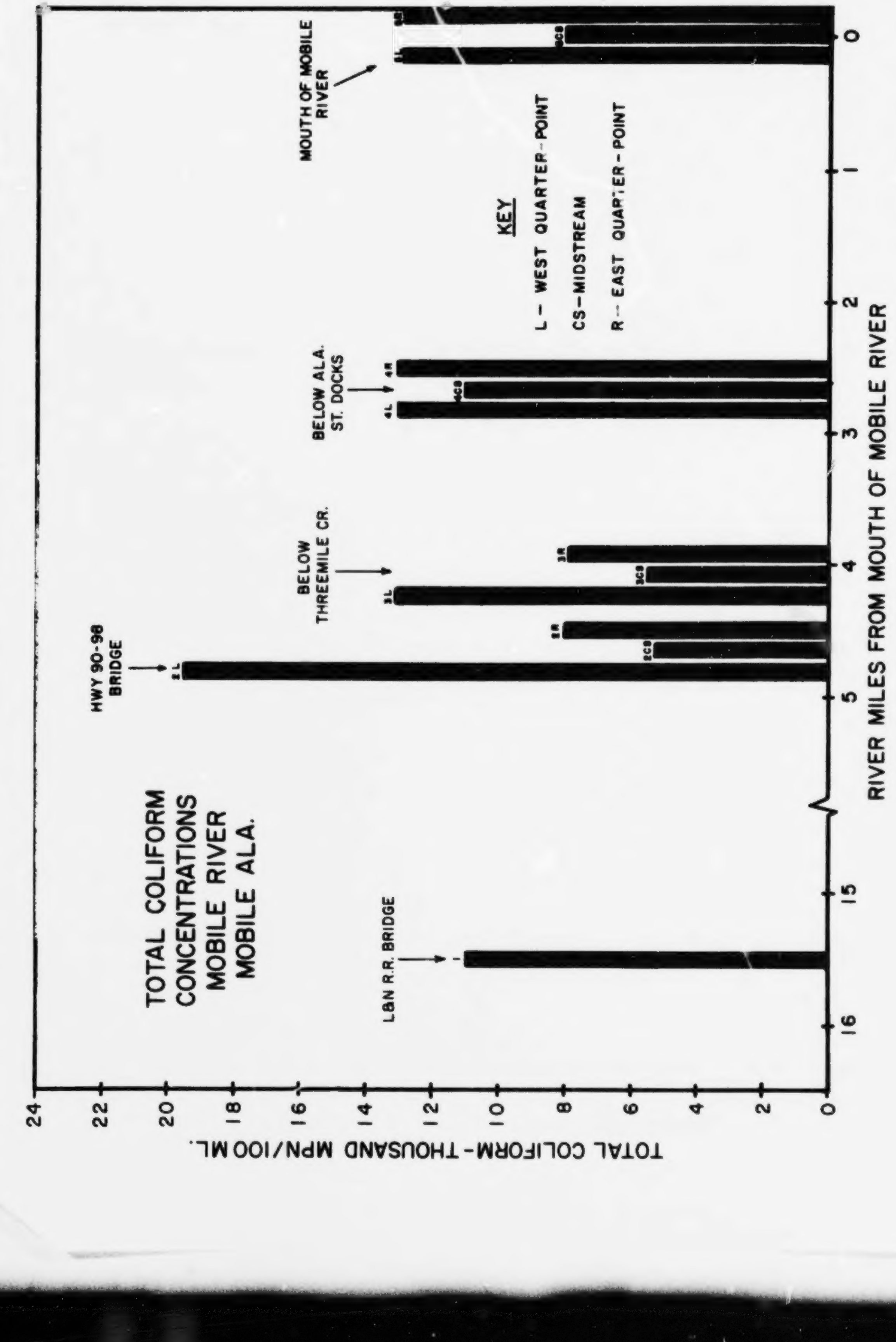

TOTAL COLIFORM CONCENTRATIONS
MOBILE RIVER
MOBILE ALA.
KEY
L – WEST QUARTER-POINT
CS – MIDSTREAM
R – EAST QUARTER-POINT
MOUTH OF MOBILE RIVER
BELOW ALA. ST. DOCKS
BELOW THREEMILE CR.
HWY 90-98 BRIDGE
L&N R.R. BRIDGE
5L
5CS
5R
4L
4CS
4R
3L
3CS
3R
2L
2CS
2R
1
RIVER MILES FROM MOUTH OF MOBILE RIVER
0
1
2
3
4
5
15
16
TOTAL COLIFORM - THOUSAND MPN/100 ML.
0
2
4
6
8
10
12
14
16
18
20
22
24

FIGURE 18

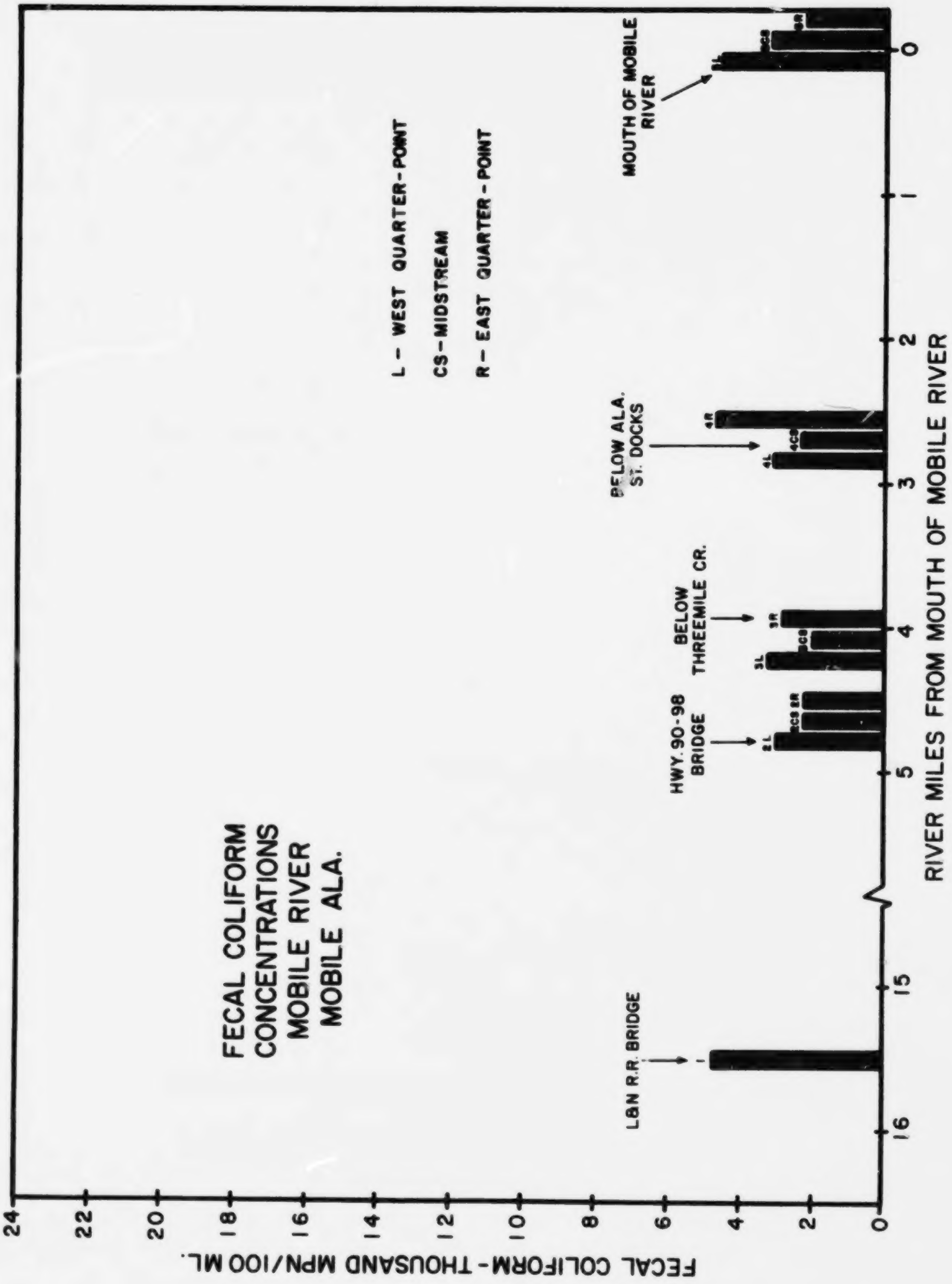
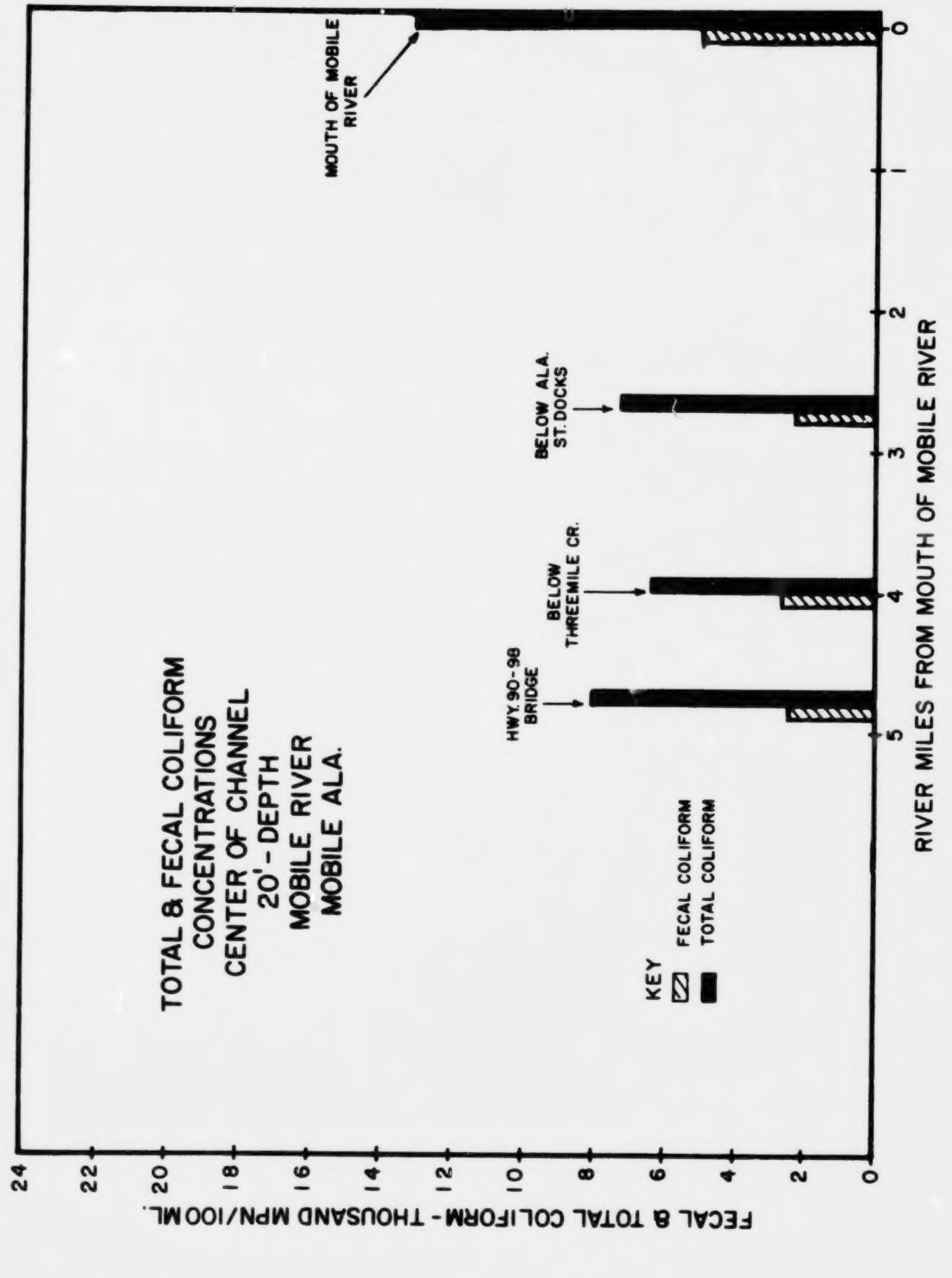

FECAL COLIFORM
CONCENTRATIONS
MOBILE RIVER
MOBILE ALA.
L - WEST QUARTER-POINT
CS - MIDSTREAM
R - EAST QUARTER-POINT
L&N R.R. BRIDGE
HWY. 90-98 BRIDGE
2L
2CS
2R
BELOW THREEMILE CR.
3L
3CS
3R
BELOW ALA. ST. DOCKS
4L
4CS
4R
MOUTH OF MOBILE RIVER
5L
5CS
5R
FECAL COLIFORM - THOUSAND MPN/100 ML.
0
2
4
6
8
10
12
14
16
18
20
22
24
RIVER MILES FROM MOUTH OF MOBILE RIVER
16
15
5
4
3
2
1
0

FIGURE 19



TOTAL & FECAL COLIFORM
CONCENTRATIONS
CENTER OF CHANNEL
20'- DEPTH
MOBILE RIVER
MOBILE ALA.

TABLE XII

Coliform Concentrations in the Mobile River and its Tributaries

Station	Location	Total Coliform Median MPN/100 ml	Fecal Coliform Median MPN/100 ml
MOBILE RIVER			
1	L&N R.R. Bridge	11,000	4,600
2R	HWY 90-98 Bridge	7,900	2,300
2C-S		4,900	2,300
2C-20		7,900	2,200
2L		19,500	3,300
3R	Below Threemile Creek	7,900	2,800
3C-S		5,600	1,950
3C-20		6,400	2,800
3L		13,000	3,300
4R	Below Alabama State Docks	13,000	4,900
4C-S		11,000	2,200
4C-20		7,000	2,200
4L		13,000	3,300
5R	Mouth of Mobile River	13,000	2,300
5C-S		7,900	3,300
5C-20		13,000	4,900
5L		13,000	4,600
CHICKASAW CREEK			
6	Mouth	130,000	49,000
8	Above Waste Sources	1,100	330
9	Eightmile Cr. above waste source	6,400	860
THREEMILE CREEK			
10	Mouth	48,000	4,900
11	Mouth of Ind. Canal	675,000	62,500
13	Above waste sources	1,100	270
DOG RIVER			
14	Mouth	12,000	1,750
15	Below Confl. of Eslava & Halls Mill Creek	2,200	170
16	Eslava Cr. at Hwy. 90	380,000	122,400
17	Halls Mill Creek at Hwy 90	3,550	440

the study. The median total coliform concentrations at the west-quarter point below Threemile Creek (Sta 3L), below the Alabama State Docks (Sta 4L) and at the mouth of the Mobile River (5L) were all 13,000 MPN/100 ml. Median fecal coliform concentrations were 3,300 MPN/100 ml at all west-quarter point stations, except at the mouth of the river (5L). The median concentration at the mouth was 4,600 MPN/100 ml. Median concentrations of total coliform at the east-quarter point stations were 7,900 MPN/100 ml at stations above the Alabama State Docks and 13,000 MPN/100 ml at stations below the docks. The median fecal coliform concentrations at the east-quarter point ranged from 2,300 MPN/100 ml at the Highway 90-98 bridge (Sta 2R) to 4,900 MPN/100 ml below the Alabama State Docks (Sta 4R). The median concentrations of total and fecal coliform in the center of the channel were considerably lower than concentrations at either of the quarter-points. This indicates that wastes entering the river from Mobile are not completely mixed throughout the river above its mouth. Median total and fecal coliform concentrations in the center of the channel at a depth of 20 feet were equal to or slightly higher than concentrations at the surface.

Significant waste sources discharging to Chickasaw Creek are the Scott Paper Company, International Paper Company and the Chickasaw lagoon. Median total and fecal coliform concentrations, above all known waste sources, in Chickasaw Creek (Sta 8) was 1,100 and 330 MPN/100 ml, respectively. Eightmile Creek (Sta 9), the major tributary of Chickasaw Creek, had 6,400 MPN/100 ml of total coliform, and 860 MPN/100 ml of fecal coliform in it above waste sources. Below the waste sources (Sta 6), the total coliform count was 130, 000 MPN/100 ml and the fecal count was 49,000 MPN/100 ml.

Above all waste sources in Threemile Creek the total and fecal coliform counts were 1,100 and 270 MPN/100 ml, respectively. The concentrations in the mouth of the Industrial Canal (Sta 11) were: total coliform 675,000 MPN/100 ml and fecal coliform 62,500 MPN/100 ml. The Alabama State Docks, which are adjacent to the Industrial Canal, appear to be the source of these high coliform concentrations. The Stone Container Corporation and Mobile's Threemile Creek sewage treatment plant are souces of bacterial pollution in Threemile Creek. The total coliform concentration at the mouth of Threemile Creek (Sta 10) was 48,000 MPN/100 ml and the fecal coliform concentration was 4,900 MPN/100 ml.

The only known significant waste source in the Dog River basin is Mobile's Eslava Creek sewage treatment plant. Concentrations of total and fecal coliform were 380,000 MPN/100 ml and 62,500 MPN/100 ml, respectively, in Eslava Creek above the sewage treatment plant, indicating that an unknown source of waste discharges to Eslava Creek. The other major tributary of the Dog River is Halls Mill Creek. Concentrations above waste sources in this creek were total coliform 3,550 MPN/100 ml and fecal coliform 440 MPN/100 ml. At the mouth of the Dog River the total coliform was 12,000 MPN/100 ml and the fecal coliform was 1,750 MPN/100 ml.

E) Projected Concentrations at the Oyster Beds

The bacterial water quality of the Mobile River was used as a base to project the total and fecal coliform concentrations that would be expected at the oyster beds if the waste sources from Mobile were significantly reduced. To accomplish this, the coliform concentrations contributed to Mobile Bay from the Mobile River when waste sources are eliminated must be determined. As stated previously, the coliform concentrations in the center of the channel at the Highway 90-98 bridge (Sta 2) are uncontaminated by wastes from Mobile and represent the remainder of the background coliform concentrations after they have traveled from the L & N Bridge to this station. Figures 20 and 21 illustrate the total and fecal coliform concentration profiles in the center of the channel at the surface. Dieoff in the River was assumed to follow a logarithmic decrease between the L & N and Highway 90-98 Bridges.

$$N = N_o\text{-}10^{-kt} \qquad (3)$$

N = number of coliform remaining

N_o= initial concentration

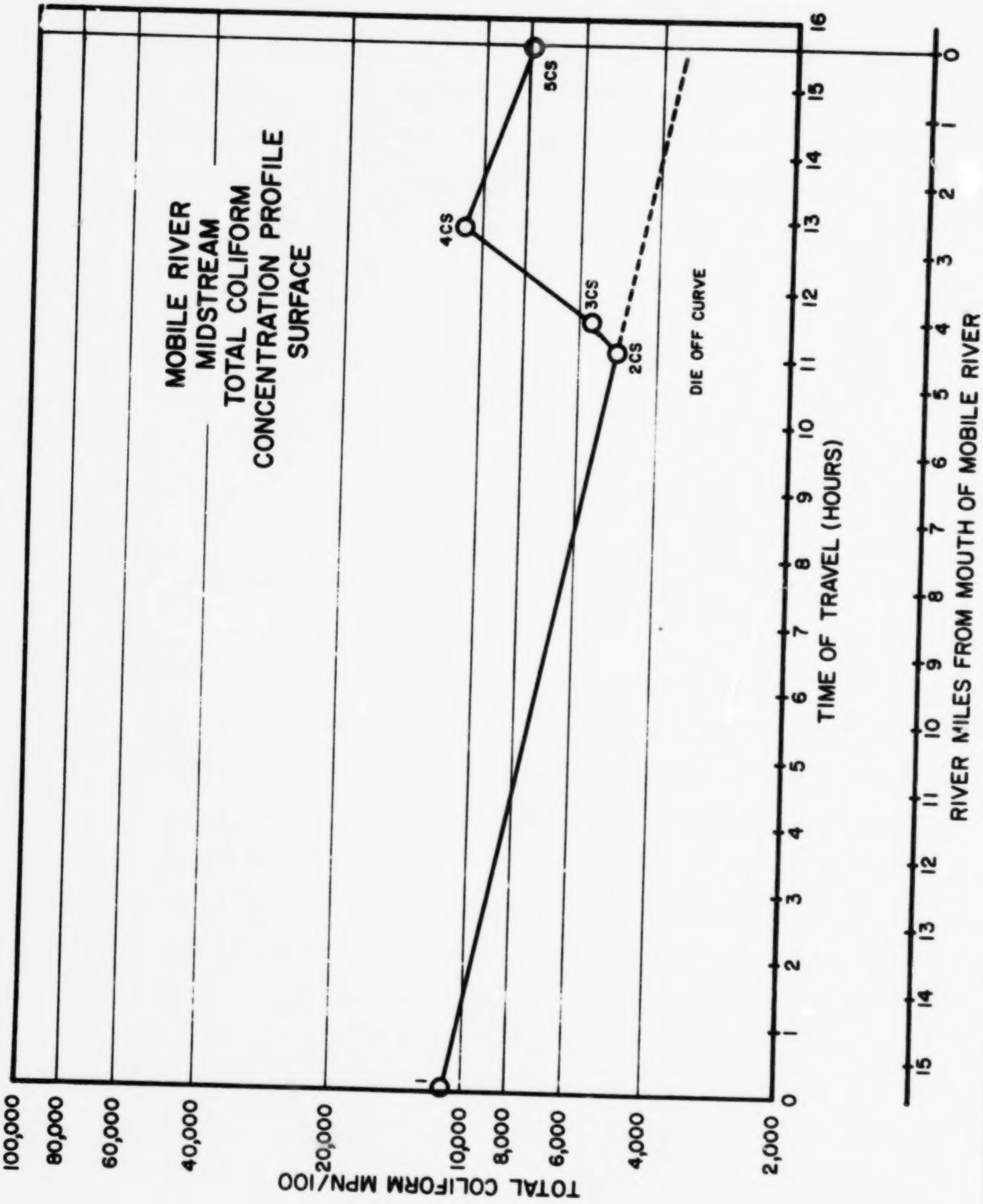
K = dieoff rate

t = time of travel

The dieoff rates for total and fecal coliform calculated were 0.76 and 0.78/day, respectively. This was based on a calculated average velocity in the river of one mile per hour. Since physical conditions in the river between the Highway 90-98 Bridge and the mouth of the river are similar to those upstream, the dieoff rates in the lower reach of the river would be expected to be the same as those previously reported. Therefore, the concentration that would occur at the mouth of the Mobile River with wastes from Mobile eliminated could be determined by extending the dieoff curves in Figures 20 and 21 to the mouth of the Mobile River (Sta 5C-S). The total and fecal concentrations determined in this manner were 3,600 and 1,450 MPN/100 ml, respectively.

To determine the concentrations at the oyster beds the time of travel between the beds and upper Mobile Bay must be estimated. The flushing time of the bay (15) was used as a base for this evaluation

FIGURE 20



MOBILE RIVER
MIDSTREAM
TOTAL COLIFORM
CONCENTRATION PROFILE
SURFACE

and was calculated to be 4.3 days. This assumes that the bay is completely mixed and freshwater flows uniformly down it. This is not the case in Mobile Bay. Current studies and the iso-coliform patterns in the bay indicate that freshwater discharges down the western quarter of the bay. This reduces the effective volume of the bay by 75%. The flushing time of the western quarter of the bay or the time of travel from the freshwater source to the mouth of the bay is, therefore, on the order of one day.

The dieoff rates in Mobile Bay were calculated by assuming the same principle of logarithmic dieoff between Upper Mobile Bay and the oyster beds. The concentrations in upper Mobile Bay were determined by a mass balance of concentrations in the Mobile and Tensaw River. Concentrations at the mouth of the Tensaw River were assumed to be equal to concentrations estimated at the mouth of the Mobile River when wastes from Mobile were eliminated. The calculated median total and fecal concentrations in upper Mobile Bay were 5,760 MPN/100 ml and 1,750 MPN/100 ml, respectively. To determine coliform concentrations at the oyster beds nine samples were collected at the oyster bed in the vicinity of the Dauphin Island Causeway on February 12, 1969. This is one of the most productive oyster beds in Mobile Bay. The median total coliform concentration was 920 MPN/100 ml and the median fecal coliform concentration was 23/100 ml. Using these concentrations and those observed at the mouth of the river with a one day time of travel, the dieoff rates were calcualted to be 0.8 per day for total coliform and 1.9 per day for fecal coliform.

The dieoff rates calculated above were applied to the total coliform concentration of 3,600 MPN/100 ml and fecal coliform concentration of 1,450 MPN/100 ml to estimate median concentrations at the oyster beds with complete abatement of bacterial pollution from Mobile. The concentrations determined were 575 MPN/100 ml of total coliform and 18 MPN/100 ml of fecal coliform. The total coliform concentration would have been approximately eight times higher than the shellfish standard even if no waste was contributed by Mobile.

The results of this investigation indicate that total coliform concentrations at the oyster beds will be significantly greater than the shellfish standard even if complete abatement of wastes from Mobile is achieved. Since these high concentrations can not be associated with fecal pollution, the present shellfish standard appears to be unrealistic. The implementation of a fecal coliform standard would appear to be more reasonable in this case. A coordinated effort by the U. S. Public Health Service and FWPCA should be undertaken immediately to determine an acceptable numerical criterion for fecal coliform with respect to approval of areas for shellfish harvesting.

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APPENDIX

A) Letter of Request from Mayor of Bayou La Batre to Secretary of the Interior

B) National Shellfish Sanitation Program

C) Typical Shellfish Closure Order - Mobile Bay

D) Typical Shellfish Opening Order - Mobile Bay

E) Sampling Stations - January - February 1969

APPENDIX A

City of Bayou La Batre
J. A. (GUSSIE) WINTZELL, MAYOR
BAYOU LA BATRE, ALABAMA 36509

MISS OLGA N. RASMUSSEN
Clerk-Treasurer

COUNCILMEN
O. J. BOSARGE
C. LEON McGALLAGHER
HARVEY A. NELSON
M. G. TEMME
J. M. WIGFIELD, JR.

March 4, 1968

Hon. Stewart L. Udall,
Secretary of the Interior,
Washington, D.C.

Dear Mr. Secretary:

It is my understanding, as the representative leader and having the consent of the City Council, that we have a direct appeal for abatement hearings under the 1965 Water Pollution Act when economic hardships exist when shellfish harvesting and growing areas are closed by state action. As Mayor of the City of Bayou La Batre, Alabama, I am formally requesting the Federal Water Pollution Control Administration for abatement proceedings into the annual closing by the Alabama State Health Department of the oyster reefs of Mobile Bay and adjoining estuarine areas because of bacteriological pollution.

The oyster industry furnishes a minimum of sixty (60) percent of the total economy to our City and a much larger percentage to persons living in the local communities around Bayou La Batre. There are approximately fourteen hundred (1400) oyster licenses issued by the State Conservation Department for taking oysters by tonging in the state. Of the fourteen hundred (1400) issued this year one thousand (1,000) of these licenses are issued to men residing in our local area. The oyster season was closed on January 12th of this year and is still closed as of this date. The pollution problem has caused closure of reefs during peak output for the past eighteen years and the periods of closure have increased as the years have gone by. The closure this year has been the longest and, therefore, indicates that the agents of pollution are increasing in the rivers that empty into Mobile Bay and adjoining estuarine bodies.

The economic hardships derived from the prolonged closure of the oyster reefs have been colossal. Families have had their water, heat, and electricity shut off for nonpayment of bills, forclosure notices on their homes, mortgage forclosures on some of the businesses, all of which is no fault of the Oystermen.

Mr. Secretary, we have exhausted all known avenues on the local and state levels for a solution to this pollution problem but have only met a stone wall. We, also, requested help from the U.S. Public Health Service Shellfish Laboratory on Dauphin Island, Alabama, but they informed us they had no authority in the pollution of shellfish in the local area.

Mr. Secretary, I have outlined this problem of pollution and how it has affected us economically. If any additional information is needed please do not hesitate to contact me.

Hon. Stewart L. Udall
Page 2
March 4, 1968

The citizens of Bayou La Batre and the surrounding communities will appreciate every consideration that you and your representatives can give this problem.

Sincerely,

J. A. Wintzell, Mayor

JAW/R

APPENDIX B

NATIONAL SHELLFISH SANITATION PROGRAM

The objective of the National Shellfish Sanitation Program (NSSP) is that shellfish will be safe to eat. Shellfish are filter feeders obtaining their food from the surrounding aquatic environment. Thus, the sanitary quality of shellfish is a function of the sanitary quality of the waters in which they are grown. Under a given set of conditions, shellfish taken from polluted waters can be, and have been, vectors of communicable disease. Since many shellfish are consumed raw or partially cooked, the NSSP places major emphasis on the sanitary quality of the water in which they are grown. As a result, sanitary standards for shellfish growing areas have been established by the NSSP. Growing area standards in Alabama are essentially the same as those of the NSSP. State regulations (and NSSP standards) require state officials to prohibit shellfish harvesting from areas where the coliform levels exceed a median MPN of 70/100ml, or where more than 10% of the samples exceed an MPN of 230. In addition to bacteriological standards, area evaluations are also based on sanitary surveys.

The U. S. Public Health Service (USPHS), in carrying out its responsibilities in the NSSP, periodically evaluates state programs to determine if NSSP requirements are being met. State shellfish sanitation control programs meeting minimum NSSP requirements are endorsed by the USPHS. The USPHS publishes semi-monthly the Interstate Shellfish Shippers List (ISSL), which lists state certified shellfish dealers meeting state and NSSP requirements. The list is distributed to the shellfish industry, food control authorities, and other interested groups. Through this mechanism, certified shellfish move freely in interstate trade. The shellfish economy of coastal states is heavily dependent upon the market of interior states. Thus, the loss of out-of-state markets would have serious economic impact upon a state's shellfish economy. Loss of market could occur in at least two ways. First, the USPHS could terminate its endorsement of a state's program--with the state's name and shippers deleted from the ISSL--if serious state program defects were observed, and, secondly, state control agencies could remove a dealer's name from the ISSL for violation of public health regulations and thus exclude him from interstate and intrastate trade. In either event, food control authorities in receiving states would not accept shellfish from non-certified sources or from a state whose program was not endorsed by the USPHS.

STATE OF ALABAMA) **APPENDIX C** **Typical Closure Order**

MONTGOMERY COUNTY)

I, Ira L. Myers as State Health Officer, acting under the authority vested in me by the laws of the State of Alabama, and pursuant to the rules and regulations of the Alabama State Board of Health governing the production, shucking and handling of oysters, adopted the 19th day of October, 1966, do hereby declare that the following described area is a grossly polluted closed area from which the taking of oysters for market purposes shall not be permitted:

I
CLOSED AREA

1. All that portion of Mobile Bay and tributaries, lying North of a line extending in an Easterly direction from the South bank of East Fowl River at its mouth to lighted beacon flashing every 2 seconds (FL ev 2 sec "2") thence in an Easterly direction to lighted beacon flashing green every 4 seconds (FLG ev 4 sec "23") at Mobile Ship Channel, thence in a Northeasterly direction to Daphne.

2. All of Bayou Coden and that portion of Portersville Bay extending 1000 feet on each side on a straight line connecting the shore to a lighted beacon flashing red (FLR "2") and lighted beacon flashing (FL "1").

3. All of Bayou LaBatre and that portion of the adjoining waters extending 1000 feet on each side of a line connecting lighted beacon fixed red (FR) and lighted beacon fixed red (FR "2").

4. All of that portion of water extending 1000 feet from the outfall of the Dauphin Island sewage treatment plant.

5. All of Bon Secour River lying upstream from a line extending due North from the East bank of the inlet to Oyster Bay from said Bon Secour River.

II
TEMPORARILY CLOSED AREA

1. All that portion of Mobile Bay and tributaries lying South of a line extending in an Easterly direction from the South bank of East Fowl River at its mouth to lighted beacon flashing every 2 seconds (FL ev 2 sec "2") thence in an Easterly direction to lighted beacon flashing green every 4 seconds (FLG ev 4 sec "23") at Mobile Ship Channel, thence in a Northeasterly direction to Daphne.

2. All of Mobile Bay, Heron Bay and that portion of Mississippi Sound and contiguous waters in the Dauphin Island-Cedar Point area East of a line extending in a Southerly direction from a point on Mon Luis Island Midway between Barry Point and Barren Point, to a lighted beacon fixed green (FG) at the intersection of ranges C and D of the Inter-coastal Waterway, and thence due South to Dauphin Island.

APPENDIX C - CONT'D

The above described area shall be closed for the taking of oysters for market purposes on and after 6 O'clock P.M. the 12th day of January, 1968, and until such future date as the Alabama Department of Public Health, through regulation, may open same.

Maps showing area are on file with the Alabama Department of Public Health, Montgomery, Alabama, the Department of Conservation, Montgomery, Alabama, Baldwin County Health Department, Bay Minette, Alabama, and the Mobile County Health Department, Mobile, Alabama.

Ira L. Myers, M. D.
State Health Officer

Dated this the 10th day of January 1968.

APPENDIX D

Typical Opening Order

STATE OF ALABAMA)

MONTGOMERY COUNTY)

I, Ira L. Myers, as State Health Officer, acting under the authority vested in me by the laws of the State of Alabama, and pursuant to the rules and regulations of the Alabama State Board of Health governing the production, shucking and handling of oysters adopted the 19th day of October, 1966, do hereby find that a certain area in Mobile Bay in the State of Alabama, more particularly described below, and part of which area was closed as shown by my order dated the 12th day of January, 1968, is an approved oyster growing area as defined by Section 3 of said rules and regulations, and I, therefore, declare said area to be open to the taking of oysters for market purposes until such future date as the Health Department, through regulation, may close same.

OPEN AREA

All that portion of Mobile Bay and tributaries lying South of a line extending in an Easterly direction from the South bank of East Fowl River at its mouth to lighted beacon flashing every 2 seconds (FL ev 2 sec "2") thence in an Easterly direction to lighted beacon flashing green every 4 seconds (FLG ev 4 Sec "23") at Mobile Ship Channel, thence in a Northeasterly direction to Daphne.

All of Mobile Bay, Herron Bay and that portion of Mississippi Sound and contiguous waters in the Dauphin Island-Cedar Point area East of a line extending in a Southerly direction from a point on Mon Luis Island midway between Barry Point and Barren Point, to the lighted beacon fixed green (FG) at the intersection of ranges C and D of the Intercoastal Waterway, and thence due South to Dauphin Island.

That portion of Bon Secour Bay North and West of a line between the end of Engineers Pier at Ft. Morgan and Mullet Point.

The above described area shall be open for the taking of oysters for market purposes on and after 6 O'clock A.M. this the 4th day of March, 1968, and until such future date as the Health Department, through regulations, may close same.

Maps showing area are on file with the State Health Department, Montgomery, Alabama, the Department of Conservation, Montgomery, Alabama, Baldwin County Health Department, Bay Minette, Alabama and the Mobile County Health Department, Mobile, Alabama.

Ira L. Myers, M. D.
State Health Officer

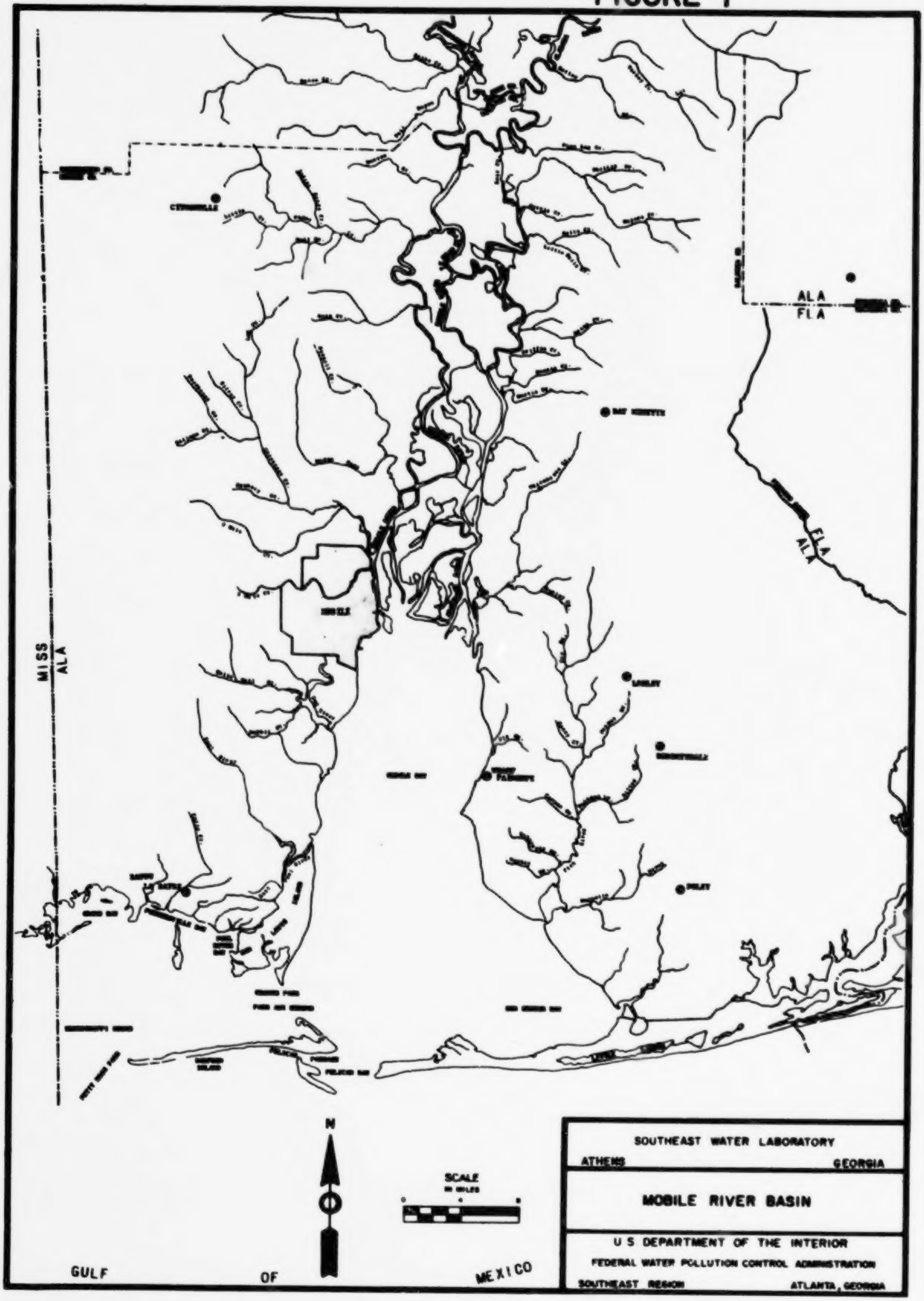
Dated this the 4th day of March. 1968.

APPENDIX E

Sampling Stations
Jan.-Feb. 1969

Station	Location
1	Mobile River - L&N R.R. Bridge - midstream
2L	Mobile River - U. S. Hwy 90 Bridge - west qtr point
2C-S	Mobile River - U. S. Hwy 90 Bridge - midstream
2C-20	Mobile River - U. S. Hwy 90 Bridge - midstream - 20' below surface
2R	Mobile River - U. S. Hwy. 90 bridge - east qtr point
3L	Mobile River - Cable crossing below Threemile Cr. - west qtr. point
3C-S	Mobile River - Cable crossing below Threemile Cr. - midstream
3C-20	Mobile River- Cable crossing below Threemile Cr. - 20' below surface
3R	Mobile River - Cable crossing below Threemile Cr. - east qtr point
4L	Mobile River - opposite Pier A, Ala. State Docks - west qtr point
4C-S	Mobile River - opposite Pier A, Alabama State Docks - midstream
4C-20	Mobile River - opposite Pier A, Ala. State Docks - midstream - 20' below surface
4R	Mobile River - opposite Pier A, Ala. State Docks - east qtr point
4A-L	Mobile River - at Bankhead Tunnel - west qtr point
4A-S	Mobile River at Bankhead Tunnel - midstream
4A-20	Mobile River - at Bankhead Tunnel - midstream - 20' below the surface
4A-R	Mobile River - at Bankhead Tunnel - west qtr point
5L	Mobile River - opposite southern tip of Pinto Island - west qtr point
5C-S	Mobile River - opposite southern tip of Pinto Island - midstream
5C-20	Mobile River - opposite southern tip of Pinto Island - midstream- 20' below surface
5R	Mobile River - opposite southern tip of Pinto Island - east qtr point
6S	Chickasaw Creek - at L&N R.R. bridge - midstream

FIGURE I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OF
MEXICO

SOUTHEAST WATER LABORATORY
ATHENS GEORGIA

MOBILE RIVER BASIN

U S DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
SOUTHEAST REGION ATLANTA, GEORGIA

MR. TRAINA: Our report this morning will be presented by two of our staff members, Mr. F. J. Silva, who is Chief of our Estuarine Studies,(formerly Mr. Silva was associated with the National Shellfish Program, both the Southeast Region and the national headquarters) and Mr. Gallagher, who is Chief of our Engineering Services Program.

By way of background, in March 1968 the Federal Water Pollution Control Administration was requested to investigate the water pollution problems associated with the periodic closures of the shellfish beds in Mobile Bay. An extensive review, test data and information was made and in January and February of 1969 a field survey was conducted by our staff to measure and evaluate waste sources in the area. The report that you will hear today summarizes and relates pertinent shellfishing statistics and water quality and waste source information collected by both the Federal Government and the State government from 1949 to 1969.

First in our presentation Mr. Silva will give a description of the area under consideration, secondly a discussion of the general effects of periodic closures of the bay to shellfish harvesting caused by degraded water quality, then he will be followed by Mr. Gallagher, who will discuss the waste sources and their effects on Mobile Bay and present the conclusions and recommendations of the Federal report.

Mr. Silva.

F. J. SILVA, CHIEF
ESTUARINE STUDIES, SOUTHEAST
WATER LABORATORY, ATHENS, GEORGIA

MR. SILVA: Thank you, Mr. Traina.

Mr. Chairman, Dr. Myers, Mr. Crockett, ladies and gentlemen.

My name is F. J. Silva. I am with the Federal Water Pollution Control Administration, located at the Southeast Water Laboratory, Athens, Georgia.

As Mr. Traina said, I will discuss two points, a general description of the basin that we are dealing with and the economic effects of closures of the bay to the shellfish industry.

Mobile Bay is a relatively large shallow bay with an overall area of approximately 419 square miles, having an average depth of 9.8 feet, and a maximum depth of 60 feet. The configuration of the bay can be seen by the illustration here on the stand behind me.

The Mobile River-Mobile Bay drainage basin comprises approximately 2,000 square miles of Mobile and Baldwin Counties. Although the drainage area defined by these limits is relatively small, waters flowing into the space drain approximately 64 percent of Alabama as well as portions of Georgia, Mississippi and Tennessee, giving a total of 44,170 square miles draining into Mobile Bay.

The average annual precipitation in the basin is 57.5 inches, which is the highest of any basin in Alabama.

Due to the large drainage area and unregulated flood flows on the Alabama and Tombigbee Rivers, the flow into Mobile Bay through the Mobile River system varies widely, ranging from 10,000 cubic feet per second during the dry fall months to more than 532,000 cubic feet per second during the spring floods.

Flow in the Mobile River is influenced by natural diversion to the Tensaw River below Mount Vernon. It is estimated that approximately 60 percent of the flow in the Mobile River is diverted to the Tensaw during periods of low water flows and 50 percent diverted during high tide flows.

Major tributaries of the Mobile River include Threemile Creek, Chickasaw Creek and Bayou Sara. Major tributaries entering Mobile Bay other than the Mobile River include the Tensaw River, Spanish River, Apalachee River, Blakely River, Dog River, Fowl River, and Fish River. The Spanish, Apalachee and Blakely Rivers are straits originating in the Tensaw River.

The principal cities within the Mobile Basin are Mobile, Prichard and Chickasaw. At the present time, approximately 320,000 people reside in the immediate Mobile metropolitan area. Projections indicate that the population will increase to 390,000 by 1975. The upper portion of the bay and Mobile River are presently heavily industrialized. However, there are still large tracts of undeveloped land and expansion of present industries and location of new industries is anticipated. A shipping channel has been approved to connect the Deer River with the main channel of Mobile Bay in anticipation of an industrial park soon to be constructed on the Deer River.

I will now discuss shellfishing in the bay and the general effects of periodic closures of the bay caused by degraded water quality.

Management of the shellfish industry in Alabama is jointly administered by the Alabama Department of Conservation and the Alabama Department of Public Health. The conservation agency is responsible for protection, propagation and conservation of shellfish and other seafood resources. The health agency is responsible for carrying out sanitary controls over shellfish growing, harvesting, and handling in the interest of public health. The term "shellfish" refers to oysters, clams and mussels. As far as this report is concerned, the term "shellfish" will refer to oysters.

In carrying out its oyster sanitation control program, Alabama participates in the voluntary National Shellfish Sanitation Program administered by the United States Public Health Service. Under the program, direct sanitary controls over shellfish production are applied by the individual States. In general, under these controls, shellfish harvesting areas are designated as approved when the following criteria are satisfied:

1. The area is not so contaminated with fecal material that consumption of the shellfish might be hazardous.

2. The area is not so contaminated with radionuclides or industrial wastes that consumption of the shellfish might be hazardous.

And 3. The total coliform median most probable number of the water does not exceed 70 per 100 milliliters and not more than 10 percent of the samples ordinarily exceed 230 per 100 millileters in those portions of the area subject to the most unfavorable hydrographic and pollution conditions.

The Public Health Service manual states that these coliform limits need not be applied if it can be shown by detailed study that the coliforms are not of direct fecal origin and do not indicate a public health hazard. The Alabama regulations, which constitute the legal State standard, do not specifically include the latter provision.

In Alabama, oysters are the only shellfish species in commercial production. The State health agency determines and classifies oyster growing areas. Three classifications are used in delineating sanitary water quality of Mobile Bay for oyster harvesting purposes. Growing areas are classified in the State oyster regulations as "Approved Oyster Growing Areas," "Grossly Polluted Closed Areas," and "Moderately Polluted Restricted Areas." Growing area maps issued by the health agency identify Permanently Closed and Temporarily Open or Closed areas, whatever the case may be at the time. Areas not marked closed are considered open. These areas can clearly be seen on this chart behind me here. Ordinarily approximately 71 percent of the bay is open for harvesting.

Alabama conducts sanitary surveillance on the bacteriological water quality of open, temporarily closed or open, and permanently closed portions of Mobile Bay on a year-round basis.

When sanitary criteria are not met, a closure order is immediately issued by the State Health Officer, with copies of the closure sent to interested State, local and Federal health agencies, the State conservation agency, various law enforcement officials, and to all oyster plants. The Division of Seafoods of the Department of Conservation is also notified of the required closure by telephone.

Enforcement of the closure is applied at once by the Seafoods Division, located at Dauphin Island. That agency maintains patrol operations over various phases of seafood management enforcement, including the oyster closure order to prohibit oyster harvesting from permanently or temporarily closed areas. During the period when the temporary closure is in effect, State health authorities continue monitoring the waters. When the State determines that the waters have returned to a satisfactory level of sanitary quality, the temporarily closed area is opened. An opening order is issued by the State Health Officer and sent to essentially the same persons receiving copies of the closure order.

Mobile County contains the majority of oyster-producing reefs in Alabama. Most of the oyster harvesters reside in Mobile County, with the major portion of oysters harvested in Alabama taken from Mobile County waters. The most productive public oyster reefs in Alabama are in the Cedar Point and adjacent areas located in the southwest portion of Mobile Bay. The important Cedar Point reef and other adjacent reefs are located within the temporarily closed or open area. When the reefs are closed, oyster harvesting is prohibited.

Other productive reefs are also located in the Mississippi Sound and Portersville Bay. These reefs are located outside of the temporarily closed area and are not generally affected by area closures. Most of Alabama's public oyster-producing areas are located in the temporarily closed area.

Bon Secour Bay is also an important area of oyster production in Mobile Bay. A substantial amount of shellfish harvesting in Bon Secour Bay comes from privately leased grounds. The Bon Secour area is generally outside the limits of the temporarily closed area and thus is not generally affected by periodic closures.

The permanently closed waters of Mobile Bay are located in the northern portion of the Bay. The waters of the area do not meet State standards for oyster harvesting areas at any time. Degradation of water quality for oyster production is due to pollution influences from sources in and above Mobile. Oysters in the area are sparse, with few, if any, commercial reefs in existence. Information on potential productivity of the waters is lacking, e.g. suitability of bottoms or aquatic conditions to support growth.

Information on Alabama oyster harvesting by county, month, volume and value was obtained from the Bureau of Commercial Fisheries, U. S. Department of the Interior. During calendar years 1957 through 1967, Alabama produced 10.6 million pounds of oysters valued at $3.8 million. Of this harvest, 8.8 million pounds was produced in Mobile County at a value of just over $3 million. Thus, during that period, Mobile County produced approximately 83 percent of Alabama's oyster harvest, yielding 81 percent of the value. Mobile County's contribution during this period ranged from 62 to 88 percent.

Information on the volume of Alabama oysters in interstate traffic is not readily available. However, 39 State-certified dealers are shown in the January 1, 1968, issue of the Interstate Shellfish Shippers List.

Parenthetically, I might add that the January 1, 1970, version of the list shows 35 certified lists. These figures thus suggest a substantial amount of dependence by the Alabama oyster economy on interstate trade.

Oyster harvesting and its production is a highly variable phenomenon. Decreased harvest can be caused by closing productive areas because of pollution. It can also be caused by natural factors such as oyster predators, epizootics, low salinity, siltation and other environmental effects. In addition, changes in legal sizes of harvestable oysters can affect production by either increasing or decreasing the potential harvestable legal crop. Harvesting can also be affected by year-round harvesting vis-a-vis seasonal closures for conservation purposes. Shifts in oyster fishing pressures caused by harvesters electing to fish for shrimp instead of oysters because of better shrimp prices and/or yield could also affect oyster harvests.

From the 1954-1955 season to the 1967-1968 season, Mobile Bay was closed on six occasions due to pollution. There were eight seasons when no pollution closure was applied. Close analysis is required if any relationship is to be developed between closures and harvest decreases For example, during the 1961-1962 season Mobile Bay was closed for a period of time. Harvest for the season was 400,000 pounds. The following season, 1962-1963, the bay was not closed and the harvest was up to 630,000 pounds. However, the next season, the following season, where a closure was necessary, the harvest was up again to 1.3 million pounds.

Average annual shellfish harvest in this period of time during the seasons with no pollution closures was 1.02 million pounds. During seasons when closures were in effect, the average annual harvest was 915,000 pounds. Based on the January 1969 price per pound as-landed of $0.52, the average annual loss of 109,000 pounds had an average as-landed value of $56,700. These values indicate losses over a relatively long period of time, but do not consider differences in seasonal production.

Information on the as-landed values from the 1954-1955 season through the 1966-1967 season, including July 1967 through February 1968, have, therefore, been analyzed on a monthly basis. Since pollution closures took place during the months of January. February, March and April, comparisons in production differences due to pollution closures deal only with these months.

During nonclosure years, average monthly production in pounds and thousands of pounds, January 188, February 179, March 197, and April 73.

During closure years, average monthly production for this period was January 193, February 144, March 146, and April 45.

The average monthly harvesting loss when closures are in effect can be quite substantial. The respective average harvesting losses during the months when pollution closures have been in effect are 35,000 pounds in February, 51,000 pounds in March, 28,000 pounds in April. The corresponding economic losses, based on the as-landed value of $0.52 per pound average for January 1969, in Mobile and Baldwin Counties are $18,200 in February, $26,500 in March, $14,600 in April.

The above values are generally considered as conservative since they deal with Mobile Bay as an entire unit. Closures, however, generally affect Mobile County oyster harvesters to a greater extent than Baldwin

County harvesters since closures generally do not extend to Bon Secour Bay, which is a significant oyster producing area. Thus, when Mobile Bay is closed, the Mobile County side is the area affected most. When closures are applied, Mobile County oyster harvesters do not generally go to Bon Secour Bay to harvest, but may look to Portersville Bay as a source of oysters. Portersville Bay, while a productive area, is no substitute for the productive beds of lower Mobile Bay.

The as-landed value of oysters reported by the Bureau of Commercial Fisheries is that amount received by the harvesters. In a study conducted by the Florida State University, it was indicated that the true value of oysters to the community under study, after processing and distribution, was about four times the as-landed value. Studies conducted by the Georgia Agricultural Experiment Station indicate that a multiple of 3.5 can be applied to oysters as-landed values to reflect retail values. Thus, the total economic loss could be a factor of four greater than the loss based on the as-landed value and could conceivably approach $227,000 per year.

Mr. Chairman, that concludes my portion of the presentation.

MR. STEIN: Thank you.

Are there any comments or questions?

MR. WHITE: I have none.

MR. STEIN: Mr. Crockett?

MR. CROCKETT: Mr. Silva, I will not take issue at all with your analysis about the losses, but the question has occurred to my mind, these are temporarily closed beds; the oysters don't disappear; they remain there for later harvesting when the beds are reopened. I can't dismiss this from my mind.

I am not quarreling at all with your figures, but I just can't get that out of my mind. It is like a pine tree, you may not cut it today but you go back there six months later and you cut it; it has grown a little bit, as a matter of fact.

MR. SILVA: Are you asking me to respond to that point, sir?

MR. STEIN: You don't have to if you don't want to.

MR. SILVA: Well, my only comment would be that although the oysters are still there, the bay is closed for a period of 40 days, and the oysterman who has not been able to harvest, he can't pay his bills during that time. The money he has to wait for until October doesn't do a bit of good in February because of the closed areas.

MR. STEIN: Are there any other comments?

I have a comment on this, and I should give you my background because I don't want to be unfair here. Years ago before I came with the water pollution program on a fulltime basis I worked with a variety of programs in the Public Health Service and was the attorney for the National Shellfish Program.

Mr. Crockett has raised a real philosophic question. I think Mr. Silva has provided a portion of a response and you have to make up your own mind. But this notion of the as-landed value or even a value of the oyster as it relates to the community, or a clam, always seemed to me to just get a fraction of the problem and a fraction of what we were dealing with.

For example, I think--and stop me if I am wrong, Mrs. Piere--in the Washington luncheon circuit, in the restaurants where we go, the going price for oysters is between \$1.50 and \$1.75 a half dozen, if you have them at lunch. I think they raise them a little if you have them for dinner.

When we talk in terms of value of these oysters, we are dealing with something that is multiplied in value throughout the country. And when we are dealing, at least with the Federal Government, with the interstate effects on oysters, this is what we bring into play.

I grew up in a tidal area in upper New York on the banks of Jamaica Bay. When I was a boy, we thought that if the temperature was below 40° for a couple of days, it was safe to take oysters from closed areas. I don't know where we got that notion. In those days, back in the 20's, the oyster boats in New York State used to make their patrols, at least the State boats, on a regular basis. We used to wait for the weather to get cool enough and then we would slip out and go in the beds we weren't supposed to and poach oysters and eat them. I don't know how we survived. I guess we just built up an immunity. But oysters or clams, and we had both in that area, were a part of the delight of life. I think again, going back to that kind of area and being able to go out and have an extra half dozen or a dozen oysters or clams is one of the amenities of life in the area where I was brought up.

Once one has an affection for these things, one is really dealing with something that goes beyond just money. Who can say what the main attractiveness of the Gulf Coast is? But one of the great attractions to me--and here I speak as an outsider--is the wonderful oysters you can get, whether you got to Mobile, New Orleans, or Pensacola. When one comes down here one looks forward to slipping out to lunch, in the afternoon, or before dinner and having a dozen or so oysters. I say this objectively. I didn't think about it until the Commission came up here. Last week in Pensacola when we dealt with Escambia and Perdido Bay, we didn't have this kind of case. But practically every noon when the conference would recess we headed out to an oyster bar and had a dozen or two oysters and come back and then went to the meeting.

By the way, we do this on the West Coast, too. You know, like all people who grew up on the East Coast or who like these bay oysters, we are always a little provincial and think that these are better than the West Coast shellfish, although the people on the West Coast don't agree.

But the point is in dealing with interstate commerce, if oysters are the kind of thing that is a delight to living and part of life, shouldn't they be available when you want them? This is not a question, Mr. Crockett, of whether they are going to be there in six months or a year, because sure, they are going to be there. But I believe the delight in an oyster or a clam-growing economy is if someone feels the impulse for a dozen oysters or a dozen clams, he should be able to go around, even on a countrywide basis to the selected places that specialize in them, and enjoy them. If you can't do that, aren't we really losing something?

This is an attribute of life that you people in the Gulf Coast have because you have such a plentiful supply of oysters, so plentiful that you are apt to overlook this. This is not usually the case throughout the country.

Given the job and the assignment that I have now as a traveling man, I can attest that there are very few places where I can get good oysters. Certainly--I say this advisedly--at the present time, there is no better oyster around in taste that I have been able to find than you are producing in the Gulf Coast. I will just give you a personal endorsement here. With a product that tastes the way your product tastes, if you can't exploit it and ship it in interstate commerce to the maximum, I am sure the whole country is losing something.

Any other comments or questions?

If not, thank you very much, sir.

Mr. White.

MR. WHITE: Next Mr. Tom Gallagher will continue with the presentation.

T. P. GALLAGHER, CHIEF ENGINEERING SERVICES, SOUTHEAST WATER LABORATORY, ATHENS, GEORGIA

MR. GALLAGHER: I am going to discuss waste sources and water quality as they affect coliform pollution in Mobile Bay.

Five municipalities Chickasaw, Fairhope, Mobile, Prichard, and Saraland - have municipal sewerage systems including treatment plants. Chickasaw, with a lagoon-type treatment, and Fairhope and Saraland, each operating secondary plants, discharge into Chickasaw Creek, Mobile Bay, and Norton's Creek, respectively. Mobile operates five secondary plants discharging into Hall's Mill Creek, Eslava Creek, two plants to Mobile Bay, and Threemile Creek. Prichard has two secondary plants, one discharging into Eightmile Creek and the other discharging to Threemile Creek. All plants except the lagoon serving Chickasaw are equipped with facilities for chlorinating treated wastes. Mobile's plant on Eslava Creek has reached its capacity and must be expanded for treating further increases in sewage from the area served by this plant.

The only portion of a municipal sewerage system in the basin from which untreated sewage is being discharged is the downtown area of Mobile. A project has been approved for these sewers to be intercepted and sewage routed to Mobile's McDuffie Island sewage treatment plant. Secondary sewage treatment will be installed for a privately-owned system serving Alabama Dry Docks on Blakely Island, now discharging untreated sewage into Mobile River. These two untreated sources serve approximately 7,000 people.

Privately-owned systems serving Spanish Fort Estates and Windsor Square in Baldwin County are equipped with secondary treatment plants discharging into D'Olive Creek and Blakely River. Searcy Hospital, a unit of the Alabama State Hospital system at Mt. Vernon, and Mobile College discharge sewage after secondary treatment through stabilization lagoons to Cedar Creek and Chickasaw Creek, respectively. There is a need for community sewage systems and treatment facilities in Bayou La Batre, Daphne, and Satsuma to replace septic tanks serving individual homes. There is a secondary sewage treatment plant serving Dauphin Island.

The paper mills of International Paper Company and Scott Paper Company are the largest contributors of industrial wastes in the basin. Both discharge into the lower part of Chickasaw Creek adjacent to each other. Within the past few years, Scott Paper Company has constructed secondary treatment facilities while International Paper Company has provided primary treatment for its industrial waste since 1957. Domestic waste from International Paper Company is treated in a septic tank. Scott Paper Company operates the secondary facilities only in the summer and uses primary treatment during the remainder of the year. Half of the domestic wastes is treated with the industrial wastes and half is discharged into the municipal system. National Gypsum Company discharges wastes into Garrows Bend, Mobile Bay, without treatment. Stone Container Corporation discharges waste into Threemile Creek. Additional treatment is being required by the Alabama Water Improvement Commission to remove the color of this waste. Aluminum Company of America operates an essentially closed waste system for which water is returned to the plant for reuse following removal of solids in settling basins on Blakely Island. Seepage through the dikes of these basins and releases to avoid overflowing of the dikes during periods of heavy rainfall have, in the past, resulted in increases of alkalinity in Polecat Bay and a reddish color in waters of the bay. The Alabama Water Improvement Commission has reported that improvements accomplished during 1967 eliminated the need for emergency releases from the basins and now provide for return of seepage to the basins.

Stauffer Chemical Company discharges wastes into Cold Creek under controlled conditions set by the Alabama Water Improvement Commission. Courtaulds North America discharges wastes into the Mobile River through an underwater diffuser near Twenty-Seven Mile Bluff, also under conditions established by the Commission.

Diamond Alkali Company discharges waste from a retention basin into the upper end of Hog Bayou, a tributary to Chickasaw Creek. Wastes from Linde Division of Union Carbide Corporation are discharged, after settling and blending, into the canal carrying the cooling water discharge from Alabama Power Company's Chickasaw steam plant, which in turn empties into Chickasaw Creek.

American Bitumals Company's plant on Blakely Island is a potential source, but has reportedly maintained control over its oil-bearing wastes to avoid water pollution. Although Ruberoid Company discharges the major portion of its wastes into Mobile's sanitary sewerage system, part of the water used by the company reaches a ditch flowing into Woodcock Branch. At times in the past, this waste has contained material which imparted a white color to the water. The present status of this situation is undetermined, although complaints regarding colored waste have not been received for some time.

Over four years ago, waters along the Baldwin County shore of Mobile Bay were visibly affected by disturbance of the bottom of Mobile Bay by dredging for the removal of oyster shells. Such operations have been restricted to distances sufficiently far away from the shore to prevent interference with the quality of in-shore waters.

Data available in the files of the Alabama Water Improvement Commission show that gross pollution is occurring in Bayou La Batre as a result of the discharge of untreated wastes from several seafood processing plants in the area. Dissolved oxygen in the Bayou has been reported by the Commission to be zero, and a significant fish kill on June 30, 1967, was attributed to these wastes. Several smaller kills have been reported by the Commission. A partial listing of these plants in the Bayou La Batre area has been provided by the Alabama Water Improvement Commission and include Bryant's Seafood Company, Inc.; Graham Seafood Company; Independent Seafood Company; Jerry's Seafood Company; Joe's Seafood Company; Laforce Seafood Company; Lyons Seafood Company; Quality Foods; Ramos Shrimp Company; Seafood Haven; Seaman Fisheries; Sea Pearl Seafood Company; Snake Bayou Seafood Company; Southland Shrimp Company; Steele Seafood Company; Stork Seafood Company; Water Front Seafood Company; and Horton Seafood Company.

In summary, the major organic waste producing industries not connected to the municipal system are: International Paper Company; Scott Paper Company; Courtaulds North America, Incorporated; National Gypsum Company; and Stone Container Company. It is estimated that these industries discharge a total of approximately 116,000 pounds per day of five-day biochemical oxygen demand, a measure of organic concentration. On an organic demand basis, about 95 percent of the total waste discharges in the Mobile area are of industrial origin. None of the industrial waste sources employs chlorination or other means of disinfection. The domestic wastes produced by these industries generally receive septic tank treatment without chlorination.

I will now discuss water quality in Mobile River and Mobile Bay.

The major damage to water use in Mobile Bay caused by poor water quality is curtailment of shellfish harvesting during the winter and early spring months due to bacterial concentrations, specifically coliform organisms which exceed the level recommended by the U. S. Public Health Service and adopted as a standard by the State of Alabama. The coliform organisms have traditionally been used as indicators of pollution and of the possible presence of pathogens due to the difficulty of isolating the pathogens themselves. A major reservation associated with the use of the total number of coliform organisms as an indicator is that one of the principal species has been shown to be ubiquitous and not necessarily confined to situations where there are identifiable pollutional discharges. In 1961, a laboratory procedure was devised for the separation of the coliform group into its environmental source components, those of fecal origin and non-fecal origin. The fecal coliform group is representative of the coliforms associated with warm-blooded animal excreta. Therefore, the fecal coliform group is a more direct indicator than total coliform of relatively recent fecal pollution.

Coliform data in Mobile Bay and in the Mobile River above and below Mobile have been collected on a periodic basis since 1949, primarily during flood flow into the bay when the shellfish beds are usually closed. Data have been evaluated for 1949, 1950, 1961, 1962 and 1967. The 1949 and 1950 data represented conditions during which no treatment of wastes was provided at Mobile. The 1961-1962 data are representative of an intermediate condition during which some sewage treatment, both domestic and industrial, was operating. The 1967 data were collected when all of the domestic wastes from Mobile and adjacent areas except 0.9 million gallons per day out of 22.2 million gallons per day were treated and chlorinated.

Combined flows in the Alabama and Tombigbee Rivers averaged 150,000 cubic feet per second during the high flow period in 1949 and 110,000 cubic feet per second during 1950. Total coliform concentrations in the Mobile River above waste sources at Mobile had a median value of 430 per 100 milliliters during the 1949 period. In the Mobile River channel at the lower end of Pinto Island just above the bay and below waste sources, total coliform densities were 11,000 per 100 milliliters, a 26-fold increase. The Tensaw River, the other major tributary at the head of Mobile Bay, had a median density of 240 per 100 milliliters at the mouth. Coliform concentrations in the bay indicate that there is a "tongue" effect generally conforming to the channel area with increased lateral dispersion as longitudinal distance down the bay increases.

Densities in the approved shellfish areas ranged from about 200 per 100 milliliters to 1,000 per 100 milliliters. Median concentrations in the entire Bay exceeded 70 per 100 milliliters except for a portion of Bon Secour Bay.

During the high flow period of 1950, the median density above Mobile in the Mobile River was 750 per 100 milliliters. Below Mobile, at the mouth of the river, the density had increased to 23,000 per 100 milliliters, or 31 times greater. The concentration in the Tensaw River during this period was 430 per 100 milliliters. As in 1949, the pattern of coliform concentration in Mobile Bay showed high densities inflowing from the Mobile River and generally demonstrated a distribution of the highest values in the channel and along the western shore to a point south of the Dog River. Median densities of as high as 43,000 per 100 milliliters were observed. Concentrations in the shellfish areas again ranged from about 200 per 100 milliliters to 1,000 per 100 milliliters.

From mid-February to mid-April,1969,the flood runoff to the Mobile River from the Alabama and Tombigbee Rivers averaged 275,000 cubic feet per second, a record. Total coliform density in the Mobile River from above to below the Mobile area increased over four times. At this time, secondary treatment and chlorination had been applied to 62 percent of the total domestic wastes. The highest concentrations were in the channel and along the western shore of the bay. Densities in the shellfishing areas ranged from approximately 800 per 100 milliliters to 4,000 per 100 milliliters. Fecal coliform medians exhibited the same general distribution pattern. Densities increased over four times in the Mobile River from above to below Mobile. Fecal densities in the shellfishing areas ranged from 80 per 100 milliliters to 300 per 100 milliliters.

From late December 1961 to late April 1962 the mean combined flow of the Alabama and Tombigbee Rivers was about 165,000 cubic feet per second. Total coliform medians increased 16 times below the confluence of the Alabama and Tombigbee Rivers in the Mobile River to the mouth. Concentrations were 9,300 per 100 milliliters upstream from Mobile and 150,000 per 100 milliliters at the mouth of the Mobile River. Fecal coliform medians for the same points increased two and one-half times from 930 per 100 milliliters to 2,300 per 100 milliliters. Total and fecal medians in the Tensaw River were 4,300 per 100 milliliters and 430 per 100 milliliters, respectively.

From December 1966 to March 1967 the average flood flow in the Mobile River approximated 73,500 cubic feet per second. In the Mobile River immediately above Chickasaw Creek, total and fecal coliform median densities were 3,300 per 100 milliliters and 90 per 100 milliliters, respectively. Below Chickasaw Creek and above Threemile Creek, the respective total and fecal coliform densities were 6,400 per 100 milliliters and 490 per 100 milliliters. Waste discharges into Chickasaw Creek and its tributaries, Eightmile Creek and Hog Bayou, include the unchlorinated domestic effluent from the lagoons serving Mobile College and Chickasaw; chlorinated effluent from Prichard; and the primary treated effluents from Scott Paper Company, International Paper Company, and Diamond Alkali Company. Below Threemile Creek, total and fecal coliform had increased to 13,200 per 100 milliliters and 1,400 per 100 milliliters, respectively. Threemile Creek at this time was receiving untreated wastes from the Haas Davis Packing Company, chlorinated waste from Mobile, and primary treated, unchlorinated waste from Prichard. Haas Davis has recently connected to the Mobile sewer system. The section of the Mobile River from below Threemile Creek to the mouth receives untreated waste from the downtown area and from the Alabama State Docks. At the mouth of the Mobile River, the total coliform median was approximately 29,500 per 100 milliliters and the fecal coliform median was 1,400 per 100 milliliters. This represents an eight-fold increase for total coliform and a nearly five-fold increase for fecal coliform from above to below the Mobile area.

Coliform distribution in the bay was evaluated during a low flow period to determine the relative effect of high flood inflows. From August to November, 1962, the average flow of the Alabama and Tombigbee Rivers to the Mobile River was 14,300 cubic feet per second. Under these flow conditions, total coliform medians increased in the Mobile River from above to below Mobile from 430 per 100 milliliters to 9,300 per 100 milliliters. Fecal coliform medians increased from 21 per 100 milliliters to 2,300 per 100 milliliters. This represents a 22-fold increase for total coliform and a 110-fold increase for fecal coliform.

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There are certain conclusions which may be drawn from consideration of these data concerning the excessive coliform densities in Mobile Bay. The Mobile River is overwhelmingly the single most significant source of coliform pollution to Mobile Bay. The Tensaw River, the other major tributary, consistently has shown coliform concentrations at the mouth to be 5 to 53 times less than those of Mobile River at its mouth. In the Mobile River, during high flood runoff and at a time when sewage treatment and chlorination were being provided for a majority of the domestic wastes in the Mobile metropolitan area, 77 to 95 percent of the total coliform and 60 to 79 percent of the fecal coliform entering Mobile Bay was contributed from above to below Mobile. When no treatment or disinfection was provided, 96 to 97 percent of the total coliform pollution was contributed from above to below Mobile during high flow periods. During the low flow period examined, the Mobile area contribution represented 95.5 percent of the total coliform and 99 percent of the fecal coliform in the Mobile River at the mouth.

It is apparent that, although there has been some improvement due to treatment and disinfection of municipal waste sources, there are still significant increases in coliform pollution, both total and fecal, from above to below the Mobile metropolitan area. Approximately 117 million gallons per day of domestic and industrial wastes are discharged into the Mobile River and its tributaries. Of this total, about 80 percent on a flow basis represents organic industrial wastes which are known to generally produce high total coliform concentrations. At high flows, waste loads are carried along the western shore of the bay and reach the shellfishing areas before dieoff or dilution decreases the bacterial concentrations to acceptable levels. At the present time, concentrations during high flow periods are many times greater than the 70 per 100 milliliters median total coliform required for approved shellfish harvesting.

Studies by the Alabama Water Improvement Commission indicate that during high freshwater flows waters entering the bay follow the western shore on a direct route to the oyster-producing areas. The Commission has demonstrated that coliform densities increase as flow increases in the Alabama and Tombigbee Rivers.

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Data collected in the Tombigbee River near Leroy and the Alabama River near Claiborne continuously from 1960 to 1962 show that there is an imprecise direct correlation between flow and coliform concentrations, both total and fecal. As flow increases, coliform densities also increase. Therefore, at high flows, coliform densities throughout the bay will be higher irrespective of waste sources in the Mobile vicinity.

If the coliform contribution contributed at Mobile during high flow were removed and all other conditions remained constant, it is probable that, because of the direct correlation between coliform and fresh-water flow, total coliform densities would exceed the 70 per 100 milliliters standard for shellfish harvesting during high flow periods in all sections of Mobile Bay except Bon Secour Bay.

To define the bacteriological contribution of wastes from sources in the Mobile area, the Federal Water Pollution Control Administration and the Alabama Water Improvement Commission conducted a field survey during January-February 1969. The objectives of this survey were: to identify significant sources of total and fecal coliform in the Mobile metropolitan area, including stormwater runoff, and to evaluate the relative contribution of each source; and to determine whether currents in Mobile Bay could transport pollutants from the Mobile area to oyster beds in the lower bay. This survey involved sampling for both quality and flow of 12 municipal and industrial effluents as well as the sewer outfalls of the section of Mobile discharging untreated wastes.

The domestic waste sources sampled included: Threemile Creek, Halls Mill Creek, Bill Ziebach, McDuffie Island and Eslava Creek sewage treatment plants of the city of Mobile. Other domestic waste sources sampled were the two Prichard sewage treatment plants and the Chickasaw waste lagoon. Sampling was also conducted at the International Paper Company, Scott Paper Company, National Gypsum Corporation, and Stone Container Corporation. Significant point sources of pollution were not found on Blakely Island and there was negligible discharge from the Alabama State Docks due to the Atlantic and Gulf Coast port strike. Samples were collected from sanitary sewers at the intersections of Commerce and

Conti Streets and Water and St. Michael Streets to characterize the contribution from the untreated section of Mobile. Stormwater contribution was characterized by samples collected at the Southern Drain, Onemile Creek and the Big Stikney Drain. The Southern Drain discharges near the mouth of the Mobile River and Onemile Creek and Big Stikney discharge to Threemile Creek.

During the survey, the average combined flow of the Alabama and Tombigbee Rivers was 137,000 cubic feet per second. Measurements of velocity and cross sectional area showed that approximately 36,000 cubic feet per second was flowing in the Mobile River itself.

These current profiles confirm the distribution demonstrated by the coliform isolines from previous surveys in Mobile Bay. Surface water tends to move down the western side of the bay from both the Mobile and Tensaw Rivers on both tidal currents. The magnitude of the velocity of net movement is directly dependent upon the quantity of freshwater inflow. At the observed velocity, it would be possible for water from the Mobile River to reach the shellfish beds in about one day's time of travel.

To permit comparison of the relative significance of each of the waste inputs, coliform concentrations were converted to bacterial population equivalents.

There is no significant bacteriological pollution being discharged from the Halls Mill Creek, Bill Ziebach and McDuffie Island sewage treatment plants of the city of Mobile or from the two Prichard installations. Concentrations of total coliform, however, indicate that closer attention to proper operation may be necessary at Mobile's Halls Mill Creek plant and possibly at Prichard's Threemile Creek plant. The other three domestic waste sources, Mobile's Threemile Creek and Eslava Creek plants and Chickasaw's lagoon, are discharging excessive concentrations of both total and fecal coliform. Chickasaw does not have disinfection facilities and the effluent total and fecal coliform were 1,100,000 per 100 milliliters and 330,000 per 100 milliliters, respectively. The Eslava Creek plant is heavily overloaded and consequently treatment efficiencies are less than desirable. The relative total and fecal concentrations were 2,400,000 per 100 milliliters and 1,595,000 per 100 milliliters, respectively. The Threemile Creek plant is Mobile's second largest, discharging 6.5 million gallons a day. Bacterial disinfection was not effective at this plant during the survey. Effluent concentrations of total and fecal coliform were 960,500 per 100 milliliters and 41,950 per 100 milliliters. On a mass basis, these three sources discharge 5,330 bacterial population equivalents of total coliform and 2,250 bacterial population equivalents of fecal coliform. These quantities represent 4.5 percent of the total coliform discharged from point sources of waste and 7.8 percent of the fecal coliform.

All of the industrial waste sources were discharging significant concentrations of both total and fecal coliform. The largest contributor on a mass basis is the International Paper Company, with a median total coliform discharge of 55,900 bacterial population equivalents and 9,780 bacterial population equivalents of fecal coliform with concentrations of 5,400,000 per 100 milliliters and 945,000 per 100 milliliters total fecal coliform, respectively. Bacteriological pollution discharged from this installation represented 47.4 percent of the total coliform and 33.8 percent of the fecal coliform from all sources investigated. As listed previously, International Paper Company provides primary treatment only for the industrial waste and a septic tank for the domestic waste.

The other industrial waste sources in order of quantity of bacteria discharged are the National Gypsum Company, Scott Paper Company and Stone Container Corporation. National Gypsum Company had concentrations of total and fecal coliform from three to six times greater than any of the other sources at 16,000,000 per 100 milliliters and 6,350,000 per 100 milliliters, respectively. Scott Paper Company had the lowest concentrations at 230,000 per 100 milliliters and 54,000 per 100 milliliters, respectively. Scott discharges flume water which is relatively low in coliform with process water, thereby diluting concentrations and lowering the temperature. In addition, Scott's water intake is located in Chickasaw Creek upstream from the severely polluted reach, whereas International Paper's intake is located in the heavily polluted reach. Thus, Scott discharged above one-thirteenth of the quantity of coliform as

International Paper.

The four industrial sources sampled contribute 56.1 percent of the total coliform and 44.9 percent of the fecal coliform. All of the plants had inadequate treatment for both domestic and industrial wastes. For the most part, they provide septic tanks and primary treatment, respectively. Scott was providing primary treatment for a mixture of domestic and industrial wastes. Nearly 66,000 BPE of total coliform and 13,000 BPE of fecal coliform are discharged collectively by these sources.

The second greatest single source of coliform pollution in Mobile metropolitan area is the untreated section of Mobile. Concentrations of total and fecal coliform had medians of 73,000,000 per 100 milliliters and 21,450,000 per 100 milliliters. An estimated quantity of 46,500 bacterial population equivalents of total coliform and 13,700 bacterial population equivalents of fecal coliform is discharged. These figures represent 39.4 percent of all of the total coliform and 47.3 percent of all fecal coliform. Currently an interceptor sewer is being built to transport these wastes to the

McDuffie Island plant for treatment.

The 13 point sources of pollution sampled in the Mobile metropolitan area discharge more than 117,900 bacterial population equivalents of total coliform and 28,950 bacterial population equivalents of fecal coliform. Under present treatment plans, it is estimated that this total will be reduced by approximately half within the next two years due to the interception of downtown Mobile sewage. At that time, if present operating conditions continue, it is estimated that the industrial sources will contribute 92 percent of the total coliform and 85 percent of the fecal coliform discharged.

The contribution of coliform pollution from stormwater was examined during two rainstorms on February 6 and 8, 1969. The total rainfall on both days was 0.08 inches and 0.28 inches, respectively. Although these totals do not represent an intense rain, the storms, particularly the second one, were characterized by a series of short heavy downpours. The second storm had about 3.5 times more quantity of rainfall and about four times more total coliform and three times more fecal coliform than the first storm. If these figures were extrapolated to the city as a whole, approximately 3,970 bacterial population equivalents of total coliform and 985 bacterial population equivalents of fecal coliform would have been discharged during the first storm. The second storm would have produced 16,850 and 2,860 bacterial population equivalents of total and fecal coliform, respectively. These figures do not include the built-up areas of Prichard and Chickasaw. During these relatively light rainfalls, the stormwater coliform contribution from Mobile alone approximated 3 to 14 percent of the contribution from point sources of pollution. More intense rainfall would produce a greater percentage. During the periods of time that they occur, stormwater overflows are significant sources of coliform pollution in the Mobile metropolitan area.

I will discuss some of the coliform concentrations that we observed in the Mobile River during the time that this survey was conducted.

The background bacterial concentration in the Mobile River system was determined at the L & N Railroad Bridge, 15.5 miles above the mouth of the river. The median total coliform concentration was 11,000 per 100 milliliters and the fecal coliform concentration was 4,600 per 100 milliliters. The surface coliform concentrations at the Highway 90-98 Bridge in the center of the channel were considerably reduced from the values at the L & N. Bridge. Since it was observed that waste entering the river from Chickasaw Creek, which is just upstream from this location, was not thoroughly mixed through the cross section and there are no known waste sources above the station, the reduction in bacterial concentration was presumed due to natural die-off. The effects of pollution from Chickasaw Creek were evident at the west-quarter point. The median total coliform concentration was 19,500 MPN per 100 milliliters, which was the highest concentration observed in the Mobile River during the study. The median total coliform concentrations at the west-quarter point below Threemile Creek, below the Alabama State Docks and at the mouth of the Mobile River were all 13,000 per 100 milliliters. Median fecal coliform concentrations were 3,300 per 100 milliliters at all west-quarter point stations, except at the mouth of the river. The median concentration at the mouth was 4,600 per 100 milliliters. Median concentrations of total coliform at the east-quarter point stations were 7,900 at stations above the Alabama State Docks and 13,000 at stations below the docks. The median fecal coliform concentrations at the east-quarter point ranged from 2,300 per 100 milliliters at the Highway 90-98 bridge to 4,900 per 100 milliliters below the Alabama State Docks.

Significant waste sources discharging to Chickasaw Creek are the Scott Paper Company, International Paper Company and the Chickasaw lagoon. Median total and fecal coliform concentrations, above all known waste sources, in Chickasaw Creek was 1,100 and 330 per 100 milliliters, respectively. Eightmile Creek, the major tributary of Chickasaw Creek, had 6,400 per 100 milliliters of total coliform and 860 per 100 milliliters of fecal coliform in it above waste sources. Below the waste sources the total coliform count was 130,000 per 100 milliliters and the fecal count was 49,000 per 100 milliliters.

Above all waste sources in Threemile Creek the total and fecal coliform counts were 1,100 and 270, respectively. The concentrations in the mouth of the Industrial Canal were: total coliform 675,000 per 100 milliliters and fecal coliform 52,500 per 100 milliliters. The Alabama State Docks, which are adjacent to the

Industrial Canal, appear to be the source of these high coliform concentrations. The Stone Container Corporation and Mobile's Threemile Creek sewage treatment plant are sources of bacterial pollution in Threemile Creek. The total coliform concentration at the mouth of Threemile Creek was 48,000 per 100 milliliters and the fecal coliform concentration was 4,900 per 100 milliliters.

The only known significant waste source in the Dog River Basin is Mobile's Eslava Creek sewage treatment plant. Concentrations of total and fecal coliform were 380,000 per 100 milliliters and 62,500 per 100 milliliters, respectively, in Eslava Creek above the sewage treatment plant, indicating that an unknown source of waste discharges to Eslava Creek. The other major tributary of the Dog River is Halls Mill Creek. Concentrations above waste sources in this creek were total coliform 3,550 and fecal coliform 440. At the mouth of the Dog River the total coliform was 12,000 per 100 milliliters and the fecal coliform was 1,750 per 100 milliliters.

The bacterial water quality of the Mobile River was used as a base to project the total and fecal

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coliform concentrations that may be expected at the oyster beds if the waste sources from Mobile are significantly reduced. The concentrations of total and fecal coliform that would occur at the mouth of the Mobile River with wastes from Mobile eliminated were 3,600 and 1,450 per 100 milliliters, respectively. To determine coliform concentrations at the oyster beds, nine samples were collected at the oyster bed in the vicinity of the Dauphin Island Causeway on February 12, 1969. The median total coliform concentration was 920 per 100 milliliters and the median fecal coliform concentration was 23 per 100 milliliters.

Calculated dieoff rates were applied to the projected total coliform concentration of 3,600 per 100 milliliters and fecal coliform of 1,450 to estimate median concentrations at the oyster beds with complete abatement of bacterial pollution from Mobile. The concentrations determined were 575 per 100 milliliters of total coliform and 18 per 100 milliliters of fecal coliform. The total coliform concentration could have been approximately eight times higher than the shellfish standard even if no waste was contributed by Mobile.

The results of this investigation indicate that total coliform concentrations at the oyster beds will be significantly greater than the shellfish standard even if complete abatement of wastes from Mobile is achieved.

I would now like to read the conclusions and recommendations of this report, Mr. Chairman.

MR. STEIN: Wait just one moment.

As I suspected, this is going to be pretty complex. We will take a recess now.

We will stand at recess for 10 minutes.

(RECESS)

MR. STEIN: Let's reconvene.

Would you continue, Mr. Gallagher.

MR. GALLAGHER: Thank you, Mr. Chairman.

The conclusions of the Federal report are:

1. Shellfishing areas in Mobile Bay have been closed by the State of Alabama during portions of eight of the past sixteen years because total coliform densities over the beds exceeded the 70 per 100 milliliters total coliform standard for shellfish harvesting.

2. A comparison of monthly production figures for shellfish harvesting in Mobile Bay from 1954 to 1967

during open and closed periods shows substantial harvesting losses and, consequently, substantial economic losses during the closure periods. The respective average production losses during the months when closures due to pollution have been in effect are 35,000 pounds in February, 51,000 pounds in March and 28,000 pounds in April. The net production loss is approximately 109,000 pounds per year. The corresponding economic losses, based on an as-landed value of 0.52¢ per pound averaged for January 1969 in Mobile and Baldwin Counties, are $18,200 in February, $26,500 in March and $14,600 in April. A recent study of the Florida shellfish industry indicated that the final retail value of shellfish products is roughly four times the as-landed value. Therefore, the annual economic loss to the region ranges from $56,700 (as-landed value of oysters) to $227,000 (estimated retail value).

3. The most significant source of coliform pollution to Mobile Bay is the Mobile River. The coliform pollution entering Mobile Bay from the Mobile River is transported down the western shore of the bay to the major shellfishing areas during flood runoff periods.

The great majority of both total and fecal coliforms entering the bay from the Mobile River originate in the Mobile metropolitan area.

4. The median total coliform densities in the Mobile River at the mouth during flood runoff periods ranged from 150,000 to 11,000 per 100 milliliters. Seventy-seven to ninety-four percent of this total resulted from discharges in the Mobile metropolitan area. The corresponding range of median fecal coliform densities in the river at the mouth was 930 to 300 per 100 milliliters. Sixty to seventy-nine percent of this total resulted from discharges in the Mobile metropolitan area. During a low flow period examined, the respective median total and fecal coliform concentrations at the mouth of the Mobile River were 9,300 and 2,300 per 100 milliliters. The contribution of the Mobile metropolitan area amounted to 96 to 97 percent of the total coliform densities and 99 percent of the fecal coliform densities flowing into Mobile Bay from the river.

5. Ninety-seven percent of the Mobile area's municipal waste is now receiving secondary treatment and chlorination. However, the coliform density increases in

the Mobile River indicate that excessive quantities of total and fecal coliforms are being discharged by Mobile's Threemile Creek and Eslava Creek sewage treatment plants. Chickasaw Lagoon, Stone Container Corporation, National Gypsum Corporation, Scott Paper, International Paper, and the untreated section of Mobile.

6. The most significant contributor of bacterial pollution from point sources in the Mobile metropolitan area is the untreated section of Mobile. The median total and fecal coliform population equivalents from this source are 46,500 and 13,700 bacterial population equivalents respectively. This waste accounted for 50.3 percent of the total coliform and 58.3 percent of fecal coliform contributed from all sources. The second major source is the International Paper Company, which discharges 36,040 BPE or 38.9 percent of the total coliform and 6,300 BPE or 26.9 percent of the fecal coliform.

7. The four industrial effluents sampled, International Paper Company, Scott Paper Company, National Gypsum Company and Stone Container Corporation, contribute 43,000 BPE or 46 percent of the total coliform and 8,400

BPE or 33.6 percent of the fecal coliform discharged in the Mobile metropolitan area. The eight domestic waste sources sampled discharged 3,440 BPE or 3.7 percent of the total coliform and 1,500 BPE or 6.1 percent of the fecal coliform.

8. During the short periods of time when they occur, stormwater overflows are significant sources of coliform pollution. During the relatively light rainfalls when stormwater sampling was conducted, coliform contributions in stormwater runoff amounted to 3 to 14 percent of the 92,500 BPE total coliform and 23,500 BPE fecal coliform pollution from point sources. More intense rainfalls would likely produce a greater percentage.

9. There is a direct, though imprecise, relationship between river flow in the Mobile River above Mobile and both total and fecal coliform densities. As river discharges increase, total and fecal coliform densities will also increase irrespective of point sources of waste.

10. The concentrations of total and fecal coliform in the Mobile River above Mobile during high flood runoffs are such that even if the bacteriological

contribution from all sources at Mobile were removed and all other conditions remained constant, it is doubtful whether the 70 per 100 milliliters total coliform criterion for shellfish harvesting could be met anywhere in Mobile Bay except Bon Secour Bay.

11. Sewage, stormwater overflows, and industrial wastes discharged to the Mobile River from the Mobile metropolitan area, and excessive concentrations of total and fecal coliform in the Mobile River above Mobile during high flood runoff, result in pollution of Mobile Bay by bacteria. Because of this pollution, the State of Alabama under the laws of the State and the rules and regulations of the Alabama State Board of Health governing the production, shucking and handling of oysters, has closed more than 4,270 acres of oyster beds to the direct harvesting of shellfish. These closures have caused substantial economic injury resulting from the inability to market shellfish or shellfish products in interstate commerce. The estimated economic loss to the region ranges from $56,700 to $227,000 annually. Accordingly, the pollution of these navigable waters is subject to abatement under the provisions of Section 10

of the Federal Water Pollution Control Act.

Recommendations:

It is recommended that a pollution abatement program requiring the following measures be instituted:

1. Secondary treatment and effective year-round disinfection be provided for all municipal wastes. Operation of all waste treatment facilities to accomplish the highest possible removal efficiencies at all times. This recommendation is to include the following specific measures for the sources of municipal wastes listed below:

A. Threemile Creek sewage treatment plant (Mobile)--Effective disinfection of waste effluent at all times.

B. Eslava Creek sewage treatment plant (Mobile)--Expansion of plant capacity and effective disinfection of waste effluent at all times.

C. Untreated sewage discharge from downtown Mobile--Construction of interceptor sewers for diversion to McDuffie Island sewage treatment plant. This recommendation is already being implemented.

D. Stormwater overflows (Mobile, Prichard, Chickasaw)--Regular maintenance program of debris clearance from drains.

E. Chickasaw waste lagoon--Effective disinfection of waste effluent at all times.

F. Bayou La Batre, Daphne, and Satsuma, Alabama--Construction of collection system and sewage treatment facilities to replace septic tanks serving individual homes.

2. All industries provide secondary treatment for both process and domestic wastes and effective disinfection where appropriate for both process and domestic wastes. Specifically, the following program is to be carried out by the industries as follows:

The International Paper Company, the Scott Paper Company, the National Gypsum Company, the Stone Container Corporation, and the Alabama State Docks shall accomplish a waste abatement program including:

Separation of process and domestic wastes;

Secondary treatment at not less than 85 percent removal efficiencies and effective disinfection at all times for domestic wastes or connection to the municipal sewer system;

Secondary treatment at not less than 85 percen removal efficiencies for process wastes and effective disinfection at all times.

3. The seafood processing plants in Bayou La Batre and other locations in and around Mobile Bay without adequate treatment:

a. Provide screening and separate disposal of gross solids such as hulls and heads resulting from the processing of shrimps, crabs and other seafood products.

b. Provide secondary treatment of wash water resulting from machine peeling, processing and packing of peeled shrimp and the packing of whole, unpeeled shrimp. Such treatment could be provided as part of the municipal waste collection and treatment system.

4. All recommended abatement measures be in operation no later than February 15, 1973, as detailed in the Alabama water quality standards approved by the Secretary of the Interior on February 15, 1968.

5. In determining acceptability of areas in Mobile Bay for shellfish harvesting, a fecal coliform

criterion be employed in conjunction with Salmonella determinations to more effectively evaluate the probability of pathogen presence. A coordinated effort by the U. S. Public Health Service and the Federal Water Pollution Control Administration in cooperation with the States should be undertaken immediately to develop an acceptable numerical criterion for fecal coliform, for promulgation by health authorities, with respect to approval of areas for shellfish harvesting. A technical committee be established by the conferees to assist in and coordinate the development of an acceptable numerical criterion for fecal coliform. This committee should report to the conferees no later than one year from the date of the first session of this conference.

This completes the Federal report, Mr. Chairman.

MR. STEIN: Are there any comments or questio[illegible]

MR. WHITE: Yes. I would like to ask Mr. Gallagher a few questions.

In reading the report, Mr. Gallagher, I note that there is no reference to any Federal facilities in the area. Are there any and is their treatment adequate if they have such?

MR. GALLAGHER: The only Federal facility that we know about that is discharging untreated wastes to Mobile Bay is the Coast Guard station at the mouth of the Mobile River.

MR. WHITE: At the mouth of the river? Would this be picked up as a part of that downtown connector or not?

MR. GALLAGHER: I don't believe so.

MR. WHITE: Do you know how large the facility is?

MR. GALLAGHER: I understand that it has a complement of about 50 people, but I am sure the Coast Guard could reply to that.

MR. WHITE: Thank you.

Next I would like to bring up another point, since it was a major item in two recent conferences that we had in the area.

What about the dredging problem in the bay? Is there one and how does this affect the flushing characteristics and how would this contribute, say, to the pollution, to the bacteriological pollution?

MR. GALLAGHER: As you know, there is a ship channel in Mobile Bay. It is constructed longitudinally up the west shore of the bay. Maintenance dredging from that channel, as I understand it, is deposited to the sides of the channel such that the depth is very low on either side of the channel.

We could hypothesize that when high freshwater flows are coming down the Mobile River that this channel could serve, and I believe this is stated in the report, could serve as somewhat of a pipeline, forcing these high freshwater flows down the western shore of the bay into the shellfish beds more quickly than they would get there without the channel.

MR. WHITE: In other words, possibly we need to do something about spreading the fill from the channel or the material from the channel further out so it doesn't accumulate and cause this condition?

MR. GALLAGHER: That is right.

MR. WHITE: I have no further questions, Mr. Chairman.

MR. STEIN: Are there any other comments or questions?

It was an excellent report, but I would like to expand on one question **Mr. White** asked. That is, you said there was only one Federal installation discharging untreated wastes. Would you say how many Federal installations there are and how many are discharging adequately treated wastes?

MR. GALLAGHER: I don't know of any other Federal installations.

MR. STEIN: I think we should, if we can, get a rundown on that. If that is the only one, I think that should be clear for the record, but if there are others, they should be named.

MR. GALLAGHER: Yes, sir.

MR. STEIN: I just have one observation that just occurred to me as you were reading the report here.

We completed last week two conferences, in Perdido Bay and Escambia Bay, and in those places the recommendations adopted by the conferees called for 90 percent removal efficiencies by the paper companies concerned. Here you are only asking for 85, but here you are asking for disinfection. I am not sure that as far as the funding is concerned that 90 percent BOD efficiency or

85 percent efficiency plus disinfection is not really a commensurate burden on the industry. But I do note that you are asking for 5 percent less here, and as many people know, as we go higher up in any of these numerals, including BOD or carbonaceous material, as you get closer to 100 percent each percent you get out costs you much more money. Your costs increase almost geometrically, practically geometrically; and from 80 to 85 they begin to rise and from 85 to 90 they rise very precipitously. If you go over 90, they will sure rise precipitously.

MR. GALLAGHER: Yes, sir. Do you want me to respond to that?

MR. STEIN: Yes, if you would.

MR. GALLAGHER: The situation in Perdido and Escambia Bay was a question of organic pollution causing a eutrophication problem and an oxygen demanding problem.

The situation is such in Mobile Bay that we have primarily a bacterial pollution problem in the bay. We feel at this time that the 85 percent is adequate to meet organic water quality standards in Mobile Bay.

MR. STEIN: Would it be fair to state--and I don't know, you may want to state this, and the industry may, or we just may leave the question open--that considering this 85 percent plus the chlorination or plus the disinfection of the effluent, in terms of impact on an industry, is about the same kind of a requirement that that 90 percent would be in the other area?

MR. GALLAGHER: Yes, sir.

MR. STEIN: Thank you.

Are there any other comments or questions?

If not, thank you very much, sir.

Mr. White.

MR. WHITE: Yes, Mr. Chairman, the next Federal speaker will be Mr. J. David Clem, Chief of the Shellfish Sanitation Branch of the U. S. Public Health Service in Washington, D. C.

Mr. Clem.

J. DAVID CLEM, CHIEF
SHELLFISH SANITATION BRANCH
FOOD AND DRUG ADMINISTRATION
PUBLIC HEALTH SERVICE, HEW, WASHINGTON, D. C.

MR. CLEM: Mr. Chairman, conferees. My name is J. David Clem. I am Chief of the Shellfish Sanitation Branch, Food and Drug Administration, U. S. Department of Health, Education, and Welfare. This statement is of interest for the National Shellfish Sanitation Program concerning the use of Mobile Bay for commercial harvesting of oysters.

The fundamental concepts of the National Shellfish Sanitation Program are contained in the Manual of Recommended Practices for the Sanitary Control of the Shellfish Industry, Parts I, II and III, which I have here for submitting to the record.

(Which said Public Health Service Publication No. 33, Parts I, II and III, may be obtained from the HEW, PHS, Washington, D. C. 20201.)

MR. CLEM: The Manual contans the administrative and technical standards which have been developed and periodically updated through cooperative efforts of State and Federal experts in public health and shellfish sanitation. The molluscan shellfish industry, State shellfish control authorities, and the Public Health Service have participated in the National Program since 1925. In other words, a program over 45 years old. The program guidelines and procedures have been time tested and are used uniformly throughout the Nation's shellfish-producing areas. The major objective of the National Program is to assure continued safe use of shellfish for human consumption and to encourage water quality programs which will preserve potential shellfish-producing areas for this beneficial use.

Alabama's Departments of Public Health and Conservation are the recognized shellfish control agencies in Alabama. These State agencies have played an important part in our National Program actually since its inception. Annually, FDA officials evaluate Alabama's shellfish program for compliance with these national standards. We have found that Alabama officials have consistently and conscientiously applied public health control measures necessary for safe shellfish production. Consequently, Alabama oysters are certified by the State officials and listed by FDA as a certified product safe for interstate shipment.

This listing, which we in my office issue twice a month, is sent to food control officials throughout the United States, and in this issuance we have at the present time 35 Alabama shippers listed.

MR. STEIN: That used to be a green sheet when I was with the program. What happened, lost its color?

MR. CLEM: We are improving it and using computer technology to distribute it. We have advanced a little bit. (Laughter.)

(Which said list is as follows:)

December 15, 1969

INTERSTATE SHELLFISH SHIPPERS LIST

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
CONSUMER PROTECTION AND ENVIRONMENTAL HEALTH SERVICE
Food and Drug Administration

INTERSTATE SHELLFISH SHIPPERS LIST

FRESH AND FROZEN OYSTERS, CLAMS, AND MUSSELS

THE SHIPPERS LISTED HAVE BEEN CERTIFIED BY REGULATORY AUTHORITIES IN THE UNITED STATES, CANADA, AND JAPAN UNDER THE UNIFORM SANITATION REQUIREMENTS OF THE NATIONAL SHELLFISH SANITATION PROGRAM. CONTROL MEASURES OF THE STATES ARE ENDORSED BY THE UNITED STATES FOOD AND DRUG ADMINISTRATION. CANADIAN AND JAPANESE SHIPPERS ARE INCLUDED UNDER THE TERMS OF SHELLFISH SANITATION AGREEMENTS WITH THE GOVERNMENTS OF THE TWO NATIONS.

Persons, agencies, or companies interested in receiving the List, or information about the National Shellfish Sanitation Program, contact:

Chief, Shellfish Sanitation Branch
Bureau of Compliance (RC-310)
Food and Drug Administration
200 'C' Street, S.W.
Washington, D.C. 20204

Phone - (703) 557-3991

The Interstate Shellfish Shippers List is issued every two weeks.

CLASSES OF SHELLFISH SHIPPERS

RS - RESHIPPER - SHIPPERS WHO TRANSSHIP SHUCKED STOCK IN ORIGINAL CONTAINERS, OR SHELL-STOCK FROM CERTIFIED SHELLFISH SHIPPERS TO OTHER DEALERS OR TO FINAL CONSUMERS. (RESHIPPERS ARE NOT AUTHORIZED TO SHUCK OR REPACK SHELLFISH.)

RP - REPACKER - SHIPPERS, OTHER THAN THE ORIGINAL SHUCKER, WHO PACK SHUCKED SHELLFISH INTO CONTAINERS FOR DELIVERY TO THE CONSUMER. A REPACKER MAY SHUCK SHELLFISH OR ACT AS A SHELL-STOCK SHIPPER IF HE HAS THE NECESSARY FACILITIES.

SS - SHELL-STOCK SHIPPERS - SHIPPERS WHO GROW, HARVEST, BUY/OR SELL SHELL-STOCK. THEY ARE NOT AUTHORIZED TO SHUCK SHELLFISH OR TO REPACK SHUCKED SHELLFISH.

SP - SHUCKER-PACKER - SHIPPERS WHO SHUCK AND PACK SHELLFISH. A SHUCKER-PACKER MAY ACT AS A SHELL-STOCK DEALER.

December 15, 1969

ALABAMA

CERTIFICATES EXPIRE MAY 31, 1970

NAME	ADDRESS		CERT. NO.
A A RICHARDS & CO	MOBILE	ALA	90 RP
BAY OYSTER SHOP	CODEN		66 SP
BLUE GULF SEAFOOD	CODEN		5 RP
BLUE POINT SEAFOOD	CODEN		48 SP
BON SECOUR FISHERIES INC	BON SECOUR		49 RP
BON SECOUR SHELLFISH CO	BON SECOUR		28 RP
BON SECOUR FISHERIES #2	BON SECOUR		36 SP
CALLAWAYS SEAFOOD	GULF SHORES		81 RP
COLLIERS OYSTER CO	BAYOU LA BATRE		91 RP
ESFELLER SEAFOOD	CODEN		61 SP
FORDS SEA PRODUCTS CORP	MOBILE		60 RP
FOUR TS SEAFOOD	CODEN		38 SP
FOSTERS SEAFOOD	CODEN		40 SP
GRAHAM SEAFOOD	BAYOU LA BATRE		4 RP
GRASS SEAFOOD	FOLEY		41 SP
H JOHNSON SEAFOOD	CODEN		11 SP
HALL & RALEY SEAFOOD	CODEN		35 SP
KUFFSKIE SEAFOOD	FOLEY		92 SP
LADNIERS SEAFOOD	DAUPHIN ISLAND		62 SP
LEE & VON SEAFOOD	BAYOU LA BATRE		74 SP
LEES SEAFOOD	CODEN		57 SP
LITTLE FISH & OYSTER CO	CODEN		12 SP
LYONS SEAFOOD	BAYOU LA BATRE		69 SP
MEXICAN GULF FISH INC	CODEN		14 RP
MOBILE SEAFOOD	CODEN		59 SP
MUD OYSTER SHOP	CODEN		75 SP
OYSTER BAY SEAFOOD	FOLEY		55 SP
PATRONAS SEAFOOD	DAUPHIN ISLAND		80 SP
PLASH SEAFOOD	FOLEY		2 SP
RICE SEAFOOD	BAYOU LA BATRE		13 RP
SEA PEARL SEAFOOD	BAYOU LA BATRE		18 RP
STORKS SEAFOOD	BAYOU LA BATRE		98 SP
THOMPSON SEAFOOD	CODEN		32 RP
WATERS SEAFOOD	CODEN		99 RP
ZIRLOTT JAMES SEAFOOD	CODEN		33 SP

CALIFORNIA

CERTIFICATES EXPIRE FEBRUARY 15, 1970

NAME	ADDRESS		CERT. NO.
COAST OYSTER CO	EUREKA	CAL	5 SP
DIAMOND OYSTER CO	SAN FRANCISCO		34 SP
EL-MORRO OYSTER CO	MORRO-BAY		26 SP
JOHNSON OYSTER CO	INVERNESS		6 SP
WEST COAST SEAFOOD INC	SAN FRANCISCO		4 SP

CONNECTICUT

CERTIFICATES EXPIRE APRIL 30, 1970

NAME	ADDRESS		CERT. NO.
ABBOTTS LOBSTERS	NOANK	CONN	140 RS
ACQUARULO SAL	NEW HAVEN		137 RS
ALLIED GROCERS COOPERATIVE INC	TORRINGTON		134 RS
ALS SEAFOOD INC	WATERBURY		103 RS
BLOOM NORMAN R	EAST NORWALK		63 SS
BLUEPOINTS CO INC	MILFORD		4 SS
D C K MARINE CO	NEW LONDON		15 SS

DELAWARE SHELLFISH CO	NEW CASTLE	34	RS
DOLAN JOSEPH S	GUILFORD	43	RS
GAMBARDELLA BROS INC	NEW HAVEN	67	RS
GILBERT A J	WESTBROOK	1105	SS
LEWIS H J OYSTER CO	STAMFORD	51	SS
LONG ISLAND OYSTER FARMS INC	NEW HAVEN	8	SS
LOVEJOY FREDERICK F	EAST NORWALK	6	SS
MALLOY L H	NEW LONDON	76	SS
MILFORD SEAFOOD	MILFORD	27	RS
MODERN LEWIS OYSTER CO	STAMFORD	130	RS
NEW HAVEN FISH & LOBSTER INC	NEW HAVEN	104	RS
NORTH AMERICAN LOBSTER POOLS INC	DANBURY	75	RS
PALMERS CHARLES E SONS	RIVERSIDE	11	SS
PETERSON F	OLD SAYBROOK	1121	RS
RADEL ANDREW OYSTER CO	SOUTH NORWALK	5	SS
RICHMOND FROZEN FOODS INC	NEW LONDON	78	RS
STABELL ANTON C	EAST NORWALK.	1247	SS
TALLMADGE BROS	SOUTH NORWALK	10	RS
TRAHAN LUCIEN	DANIELSON	66	RS
WALSTON JOHN E JR	GUILFORD	1068	SS
WESTBROOK LOBSTER CO	WESTBROOK	128	RS
WEST HAVEN SEA FOOD MARKET	WEST HAVEN	44	RS

DELAWARE

CERTIFICATES EXPIRE MARCH 31, 1970

BROWNIES FISH MARKET	REHOBOTH	DEL	28	RS
CARTER CHARLES ELLIS	MILTON		37	SS
CLARK ELIZA	MILTON		12	SS
CROPPER OYSTER CO	DAGSBORO		26	SP
CROWES SEAFOOD	WILMINGTON DEL		33	RS
DAWSONS SEAFOOD INC	WILMINGTON		13	RS
DELAWARE SHELLFISH CO	NEW CASTLE		34	RS
DOLPHIN SEAFOODS	DOVER		27	SS
DOUGHTY MERVIN	MILLSBORO		30	SS
HICKMAN ALVIN	DAGSBORO		9	SS
FOX SAM & SON	LEIPSIC		1	SS
JENKINS IRVIN H	DOVER		16	SS
JONES HARRY S	OCEAN VIEW		4	SS
KIRKPATRICK ALLEN & CO INC	REHOBOTH BEACH		3	RP
KIRKPATRICK ALLEN & CO INC	REHOBOTH BEACH		36	RP
MARVEL ELMER	DAGSBORO		29	SS
NEW CASTLE SHELLFISH CO	NEW CASTLE		21	RS
NEWCOMB & HAND INC	DOVER		25	SS
PALMATEER DUANE F SR	MILLSBORO		14	SS
PLEASANTON JOHN E	LITTLE CREEK		8	SS
SMITH RESEARCH & DEV CO	LEWES		23	SS
STEELE PHILIP H	MILLVILLE		10	SS
TUNNELL ALFRED S	NASSAU		39	SS
VAN SCIVER DOLLY	LEWES		40	SS
WEBB CLARENCE A	FREDERICA		18	SS

FLORIDA

CERTIFICATES EXPIRE AUGUST 31, 1970

ADKINS SEAFOOD	APALACHICOLA	FLA	373	SP
ALJOS FISH CAMP	NEW SMYRNA BEACH		356	SS
AMERICAN SEAFOOD CO	PENSACOLA		403	SS
AMISON E L	APALACHICOLA		418	SS
APALACHEE BAY BRAND	APALACHICOLA		480	RP
BAKER ASSOCIATES	CEDAR KEY		538	SP
BARWICK SEAFOODS CO	PANACEA		492	SP
BAYSIDE SHELLFISH INC	APALACHICOLA		11	RP
BERRIAN E W	MILTON		81	SS
BISSIT BAY FISH CAMP	NEW SMYRNA BEACH		363	SS
BRANAN C B	ALLANDALE		556	SS
BRAMAIR J E	MILTON		514	SS
BROWNS SEAFOOD	CRAWFORDVILLE		529	SS
BRYANT & TUCKER	EASTPOINT		557	SP
BURROUS SOLLIE	NEW SMYRNA BEACH		570	SS

J. D. Clem

The shellfish growing area classification system, such as described on the map to my rear and described adequately by the Federal report, is employed by the 20 other shellfish producing States, Canada and Japan.

In order to properly classify shellfish growing waters, 1) sanitary surveys must be conducted to determine actual and potential sources of pollution, 2) water quality studies are conducted to determine chemical, microbiological, pesticidal and radiological levels, 3) seasonal variations are studied for climatic and hydrographic changes, 4) other water uses must be studied which adversely affect the water quality, and then 5) statistical analysis and public health criteria applied in order that satisfactory evaluations are made of the available data.

Mobile Bay is probably one of the most thoroughly studied estuarine areas in the country. Independent investigations, coordinated with State officials, have been made by the Public Health Services' laboratory on Dauphin Island. This laboratory is under the direction of Mr. R. J. Hammerstrom. The laboratory's technical staff has been in operation since 1963 and has conducted studies concerning pesticides and trace metals in Mobile Bay and its environs. Microbiological studies of this bay, as well as elsewhere in the Gulf Coast States, are continuing.

Oysters, bottom sediment and water samples collected from Mobile Bay for two periods: March 29 through July 23, 1965, and October 17, 1965, through July 19, 1966, were analyzed for chlorinated pesticides. Results of these studies showed no concentrations of public health significance. Trace metal studies to determine levels of cadmium, chromium, copper, lead and zinc in oysters from January to June 1968 were conducted also by the laboratory. The levels found for each metal analyzed in oyster meats were below values considered harmful for human health. These data corroborate the finding by Alabama State officials that currently approved shellfish growing areas in Mobile Bay are free of harmful chemical contamination.

It has been said quite adequately by the Federal report that the primary cause for closing specified sections of Mobile Bay to shellfishing is intermittent increases in the bacterial contamination associated with the periods of high runoff. This closing procedure is a well-established operating procedure of the Alabama shellfish control authorities and is adequately documented in the FWPCA technical report.

I wish to submit here that Alabama and Mobile Bay is not unique in the respect of opening and closing for shellfishing. For example, in 1969 you see that in Narragansett Bay, Rhode Island, the officials there alternately opened and closed the bay 13 times because of urban runoff degrading productive shellfish waters. As far away as Ladysmith Harbor in British Columbia, Canada--again I point out, a participant in this national program--control officials opened and closed the shellfish waters during periods of high runoff. They do this on the basis of these standards and closely follow the bacteriological standards of the national program.

The coliform standard used alone in judging the sanitary quality of a growing area is wholly inadequate. When employed by control officials, bacteriological information is used to interpret sanitary survey data. In all use classifications of shellfish waters throughout the States of our Nation, bacteriological standards are used as an adjunct to the sanitary survey. Any bacterial indicator system that is used must meet rigid public health scrutiny.

I am submitting here for the record an appendix which describes ideal criteria for public health bacterial indicator. This is for the use of the conferees.

(Which said appendix is as follows:)

APPENDIX A

Characteristics of An Ideal Microbiological Indicator

The ideal indicator should:

1. Yield uniform results in all types of water;
2. Be present in polluted water in proportion to pollution;
3. Always occur in greater numbers than pathogens;
4. Never be present in a safe water, but always be detectable when pathogens are present;
5. Be demonstrated by available laboratory tests which are specific, economical, and rapid, and competently accomplished with minimal technical training;
6. Not be pathogenic;
7. Be easily recovered in low numbers preceding and following the occurrence of hazardous levels of pathogens in water;
8. Not exhibit aftergrowth in aqueous environments;
9. Be more resistant to disinfectants and growth inhibitors in the aqueous environments than pathogens;
10. Be recognized legally and scientifically as a reliable indicator of pollution;
11. Not show growth inhibition in the presence of concomitant organisms;
12. Be randomly distributed in the sample.

J. D. Clem

Studies conducted by the PHS laboratory on Dauphin Island and other studies by shellfish control officials have shown the coliform group of organisms to be ubiquitous in estuarine waters and upland soils, and most especially in the southern soils we find here. Certain tests have been suggested as an improvement over the total coliform test. Most prominent you have heard today is the fecal coliform test, reputed to be a more specific indicator of warm-blooded animal pollution. The use of the fecal coliform test procedure for shellfish growing waters has been under consideration for many years by the National Program. At the present time, that is as of today, there is no universal agreement among public health experts as to the advisability of accepting a fecal coliform standard. Therefore, we do not have an established public health fecal coliform standard which can be used to classify shellfish-growing waters.

Two very recent studies have given my office reason to critically question the advisability of accepting the fecal coliform test or an indicator system, at least alone, used singly. Brezenski, in a published

J. D. Clem

report with his associates in 1969, analyzed clams and the overlying growing waters for fecal coliforms and salmonella, a disease-causing organism in an area known as Raritan Bay, bounded by New York and New Jersey. Their studies revealed the presence of salmonella in clam meat while the fecal coliform levels were relatively low, and these were in waters of known fecal contamination. Studies closer to home, again on the Gulf Coast on Dauphin Island, have found high density of fecal coliforms in unpolluted soils. So the question is still unresolved as to whether fecal coliforms would actually be a better indicator system than the total coliform indicator group now in use.

To sum up our views on the use of Mobile Bay for oyster harvesting, I submit the following points for your consideration:

1. Oysters harvested from Mobile Bay during periods specified by the Alabama Department of Public Health are safe to eat and certified safe for interstate shipment.

2. The Alabama State Department of Public Health has maintained an excellent level of water quality

surveillance; however, assuming the continued rate of economic development and population growth around Mobile Bay, the present level of surveillance will not be adequate to assure safe shellfish from Mobile Bay.

3. Bacteriological pollution of Mobile Bay causes portions of the bay to be closed during periods of high runoff. And until such time as these causes are removed or controlled, these closures must continue to be made for protection of public health.

4. Through our studies we see insidious trends in microbial degradation of Mobile Bay portending longer shellfish harvesting closure periods. These closures will also affect other areas in Mobile Bay not now affected.

5. Sources of pollution, again well spelled out in the FWPCA technical report, cause intermittent closure of the bay. They are many and complex, but in our summation we note land drainage from upland wildlife refuges, sewage treatment plants, storm runoff from metropolitan Mobile, and other cities, vessels, industrial wastes, and numerous other small sources.

6. Lastly, speaking again for the National

Program, we encourage coordinated planning for the protection of existing shellfish-producing areas, and we support pollution abatement and control programs. And we very much want to assist in any way that we can with our existing resources to assure the continued use of Mobile Bay for the production of wholesome oysters.

MR. STEIN: Thank you, Mr. Clem.

Are there any comments?

MR. WHITE: I would just like to ask, I believe you said there was a 1969 report that you published concerning fecal coliform? Is this correct, was that the reference you made?

MR. CLEM: It is listed. I have a list of references.

MR. WHITE: All right, fine, I will get that out of the record.

(Which said list of references is as follows:)

References

1) Gallagher, T. P. et. al. Pollution Affecting Shellfish Harvesting in Mobile Bay, Alabama Southeast Water Laboratory, Federal Water Pollution Control Administration, August 1969.

2) Brezenski, F. T. and Russomanno, R. The Detection and Use of Salmonellae in Studying Polluted Tidal Estuaries J. Water Pollution Control Federation, 41:5, May 1969.

3) National Shellfish Sanitation Program Manual of Operations, Part I, II, III, Public Health Service Publication No. 33, 1965.

4) Bonde, Gunner J. Bacterial Indicators of Water Pollution, A Study of Quantitive Estimation. Teknis Forlag, Copenhagen, 1963.

5) Proceedings, 6th National Shellfish Sanitation Workshop February 7-9, 1968, CPEHS, PHS, HEW

6) Interstate Shellfish Shippers List, Bi-weekly Publication Shellfish Sanitation Branch, FDA, HEW

MR. STEIN: Dr. Myers

DR. MYERS: Mr. Clem, there are two issues here that we are talking about, and lest anyone who is going to read this record be confused, I would like to be sure that we understand the two issues before us.

The reason for the calling of this conference and the request from the mayor of Bayou La Batre was initiated because of a concern for a group who were economically oppressed because of closure of the bay and because of concern over the reason for this closure. We are very much aware--I personally am very much aware--of the economic burden on this area when a closure order has to be issued. It is not taken lightly, I assure you.

I want to thank you for the other part, the other side of this question, because we are concerned with the safety of a product for consumers. You see, in turn as we seek solution to the problems of pollution and the causes for closure of the beds, we also are concerned with the safety of the product. I am thankful to you for the cooperation that has been given by you personally and by those that you represent in your agency in helping us to maintain a safe product from this area.

At the same time we are very much concerned over the repeated causes of the necessity for closure. I wonder if you would briefly run over again the alternative if I fail to carry out my duty to close this bay. What is your alternative as far as Public Health Service is concerned and what happens to this area if I fail to carry out my duty if pollution is not abated and I in fact find a condition in which a ruling is necessary for closure? Would you run back through that again, please?

MR. CLEM: Very good.

The obligation that we have on the part of the Public Health Service, and now the Food and Drug Administration, oddly enough, is a constituent agent of the U. S. Public Health Service, means that our responsibility is that we endorse acceptable programs at the State level, and Alabama has a program which is currently endorsed. If Dr. Myers fails to take proper action to classify this Mobile Bay, then we are obligated to notify every other receiving State that these shellfish do not come from approved areas, and in so doing we would put in this list that we send out to some

4,600 food control officials in the United States the fact that these shellfish would not be certified and could not be shipped in interstate or accepted in interstate commerce. And also you would bring down provisions, of course, under the Food, Drug and Cosmetic Act and whatever would be applicable under this act.

So the strength of this program is one that has worked and has a great deal of strength both in the fact that we know it has worked in protecting public health, it has worked in the case of Mobile Bay by the proper action taken by the officials, Dr. Myers and his staff, in the Alabama State Health Department.

DR. MYERS: In that regard, what happens to the shellfish that are processed by those listed on this list that may be received from other receiving areas that are not closed? Do you get the question which I am asking you, Mr. Clem? Because, you see, when we close the beds here, some of our oyster producers--not producers, but the processers get their product from other areas and continue to process the product and ship. What happens to that particular activity?

MR. CLEM: Providing that the program is not endorsed?

DR. MYERS: Yes.

MR. CLEM: The entire industry of Alabama is affected. It is an either nothing or all situation. In other words, they have an acceptable program for exercising entire sanitary controls over this industry or nothing at all, really. And the product that comes into this State then from other certified sources and then produced by these shippers would not be listed on this list and recognized as safe for human consumption. It is a very strict procedure that has to be followed under this program.

I hope I have answered your question. Maybe not entirely.

DR. MYERS: Well, I hope that this also serves to clarify in the record some of the problems that we are facing. As long as we do have a standard, we must abide by that standard. As long as we have a condition in the bay that exceeds that standard, whether it is right or wrong, in order to protect the public and to protect the shellfish industry itself, then we must abide by those rules. And, of course, some of the points that have been brought out in your statements this morning and in the statements of those preceding in this report indicate a desire on the part of this State to come to a more realistic standard as it deals with the health of people in determining the extent of pollution in the bay. That is one of those critical issues which is before this hearing today and one that I am sure we are not going to be able to resolve at this particular hearing.

I am most anxious for us to come up with a better measure of pollution as it deals with public health significance, and I hope that those who are going to testify later will touch on this subject as well.

I want to thank you very much for the presentation that you have made.

MR. STEIN: Are there any other comments or questions?

If not, just wait a minute, because I think we have something very important and very fundamental. Dr. Myers, I think personally I agree with what you said and I think your last remarks indicate possibly what we are going to have in the crux of this case. Here is what disturbs me about this, and I am not putting this out in any contentious way, but I ask both the State and certainly the Food and Drug Administration, part of the Public Health Service now, to listen.

In your statement you state--and this isn't any different, Mr.Clem, than it was in the Public Health Service when we dealt with the program--but you say this:

"At the present time, there is no universal agreement among public health experts as to the advisability of accepting a coliform standard--fecal coliform standard." That is a little different. "Therefore, under the National Program, there is no established fecal coliform standard which can be used to classify shellfish growing waters."

If we have a logical sequence that we need universal agreement before we are going to get a change, we may wait for a very, very long time.

Now, here is a situation that we are faced with in the legislation that we had and that we have under the shellfish provision, and I think Dr. Myers alluded to precisely why we got this legislation. I don't think there was anything political about it. The man who got concerned about this was a senator from Maine who had the shellfish problem and was dissatisfied with the operation of the Public Health Service shellfish program, with which I would say I have been associated. The notion, he said, if you are just going to put a circle around a shellfish area and condemn it and say you have protected the public health, sure, if you don't take anything out nobody is going to get sick, but you have just done half the job. He said, what we want you to do under this provision is try to clean up pollution and open up these areas, that is our job.

We have a report by our people who have indicated that given a reasonable program--and we will hear about the reasonableness later because we haven't heard that--but given a reasonable program to clean up, even if we do get all these sources we are not going to reduce the coliform counts. Given the standards and the requirements that Dr. Myers is required to administer at the present time we are not going to open many beds. What they are suggesting in this report is that if we take care of all these sources we believe these shellfish will be saved; there is a good chance that many will be saved; that the beds can be opened. However, if you are going to do that, you may have to change the rules.

If we talk about universal agreement among experts before we are going to change those rules, I don't know that any of the people here are going to see that in their lifetimes.

Again here is the situation we have to face. If we are going to ask industry and municipalities to spend millions of dollars for a cleanup, we have to think in terms of results. And if the State of Alabama and the shellfish growers and harvesters believe they can open their beds, we have to indicate to them either we are going to open them or no matter what we do we are not going to open them.

I would say there is one phrase that Dr. Myers used which I think might be the key to this conference if we are going to get the answer and that is a more realistic approach to the problems of shellfish sanitation and realistic rules that Dr. Myers can apply to indicate whether he can open those beds or not. And I think this is the reason why we are here.

MR. CLEM: I would just like to make one

comment if I could, Mr. Chairman, and that is that this product is shipped greatly in interstate commerce, and unless we have public health sanction on this uniformly throughout the country we really haven't served the purpose of trying to rectify the problem of Mobile Bay. And under the National Program we have that recognition that the standards applied, no matter what they are, are sufficient to protect public health.

Now, we have worked, up to this point in time--maybe this is a signal for a change--for uniform standards, not only in this country but these are used internationally. So how do we reconcile these two points?

I hope if this conference committee recommended by the technical report can get together in the next year, perhaps we can seek some solutions to these impasses.

MR. STEIN: Sir, I don't think anyone is suggesting--again let me get a little personal here, because I think a lot of you people know me--I don't think anyone is suggesting we do this unless on a national or perhaps international basis. But the fact that we are on a national or an international basis and have to set up a standard doesn't scare me one whit. I don't know what Dr. Myers' participation is, but I have learned that the National Radiation Protection Commission setting up the radiation standards, the Interstate Quarantine Shellfish, and various other groups, and the people who set the standards are just people like you and me. Who else is on these committees? If we have to do this on a national basis to get this equitably, let's try to do it.

But what I am suggesting, Mr. Clem, is let's not say that we have a situation where no matter what kind of treatment we are going to ask for, we cannot hold out any hope for these people that they are ever going to be able to do better than they are now in the opening of the shellfish beds, because I think we have had reaction from the Congress on that already. I don't think the situation is going to change. And I think they are expecting us to do the job.

In other words, again without prejudging the case, where you get significant closures of shellfish bays due to high bacterial counts, as far as I can see the Congress and most of the people think that is evidence of pollution. They expect us as public officials to abate the pollution and open the beds. If we tell them no matter what we do we are not going to open those beds, we had better have a darned good reason.

DR. MYERS: Mr. Chairman.

MR. STEIN: Yes.

DR. MYERS: I want to pose another question and I want to preface it by saying that we don't apologize for having looked into this matter a little more deeply than some of the other sections of the United States because of our peculiar problems. We have made some studies and we have made some tests, which we don't apologize for a bit in the world, and we believe is a better test and a more realistic approach.

The question I want to raise, though, is one which is raised at the national level in reaching this universal agreement which the Chairman has just been talking about. Isn't it true that the problem of differentiating between coliform and even fecal coliform may not be the same in different parts of the world and certainly of the United States? Is there a difference of opinion based on geographic problems and based on the temperature of waters and other points or is this a universal disagreement?

MR. CLEM: I would say that I would be the first one to admit--and I have had experience in the southern parts of the country, East Coast and the West Coast--that the coliform, trying to look at the sanitary significance of this indicator, what we are talking about, is more ubiquitous, in other words we find it more widespread, in the southern parts of the country, and when we find it in our waters we cannot say as definitely or as assuredly that it is of public health significance. There are some geographical differences in this respect from my own personal observations. Again, how do we arrive at a standard? The standard is only as good as the information that goes in to support the public health reasons for it. And all I am trying to submit here is that we must look at numbers of different ways to arrive at whether or not these waters are adequately classified. The bacteriological work is only part of it, and no matter what we come up with we will need to know the source and if we clean up the sources we stand a good chance of reclaiming a lot of these shellfish waters.

MR. STEIN: We are closer, as I suspected, than we thought we were, because I think Dr. Myers has made an excellent point. In the old days when we were establishing these standards we used to talk of something related to shellfish, such as a sanitary survey, and you checked the sources to see what the coliforms were related to.

Mr. Clem in his paper referred to the runoff at Narragansett Bay in Rhode Island. Now, they may be the same. But I submit that I think you are lucky down here in Mobile because your runoff and your coliforms may be due to material lying in the land. In Narragansett Bay those people up there are persistent in paving all of Rhode Island, and if you have ever run through Rhode Island you recognize this. When they get a runoff they get precisely what Mr. Clem was talking about--an urban runoff. The kind of runoff you get here is a little different.

Now, again, as you people may have seen last week and this week, the kind of material that we are getting in these reports is a lot more sophisticated in the analysis of the reports and the analysis of pollution control. I think that if we are using new methods in the reports--and this is a point, really, Mr. Clem, I want to make. Let me back up.

When we used to deal with pollution control, if there weren't a high coliform count or an oxygen sag it wasn't polluted. Now our people are coming up with all these new tests and new approaches and evaluations of pollution control. Therefore, I think if we are going to take that as a measure of calling something polluted or not polluted, we have to again take as a measure of the control something other than oxygen and coliform. I submit that what we have done to shellfish was related in the remedial program to the--was the other side of the coin, so to speak, of the pollution analytical program that we were doing at the time, which was largely just a gross coliform count. Now we are doing something quite a bit different. Dr. Myers raised the question that since we are doing this in presenting detailed reports on pollution control, perhaps we should look at these other things as well to see if the requirements on whether we open or close a bed should not be modified or looked at in the light of the new criteria, and the new approaches we used to analyze the pollution situation.

Are there any other comments or questions?

If not, thank you very much for a really excellent statement. You have helped the conference quite a bit. Thank you, sjr.

MR. WHITE: The next Federal representative will be from the Corps of Engineers, Lieutenant Colonel Paul D. Sontag, Deputy District Engineer of the Mobile District Office.

LT. COLONEL PAUL D. SONTAG
DEPARTMENT OF THE ARMY
DEPUTY DISTRICT ENGINEER, MOBILE DISTRICT
CORPS OF ENGINEERS, MOBILE, ALABAMA

LT. COL. SONTAG: Mr. Chairman, Dr. Myers, Mr. White, Mr. Crockett.

I am Lt. Col. Paul Sontag, the Deputy District Engineer for the Mobile District Corps of Engineers. At this time with reference to the pollution of the navigable waters of Mobile Bay I would like to present a statement concerning the Corps of Engineers activities and responsibilities in this particular area.

The control of water pollution which may affect shellfish harvesting is one of the prime goals of the

Corps of Engineers in the development and maintenance of the navigable waters in the Mobile Bay area as well as other areas. Investigations as to the effect of dredging and filling operations on the estuarine ecology are an important part of the initial feasibility studies. Engineering and biological studies are conducted by our own forces and close coordination is maintained with the FWPCA, the Public Health Service, the Fish and Wildlife Service, the State Water Improvement Commission, the Department of Conservation and other Federal, State and local agencies whose primary interest is water quality and water pollution control.

After projects are completed, our efforts toward protection of the aquatic environment does not cease. Periodic dredging is required to assure that navigation is not impeded, though. Each time a channel must be dredged to maintain an adequate depth, an investigation is made to determine if any detrimental effects to the aquatic environment may occur as a result of the proposed dredging operation, with particular attention being given to shellfish producing areas in Mobile Bay.

In recent years, two studies have been conducted during dredging operations. The first study was undertaken during maintenance dredging on Chickasaw Creek. This area receives a particularly heavy industrial load and bottom sludge deposits were prevalent. The prime purpose for the study was to gather sufficient data to indicate if any radical change occurs in the water quality that could be attributed to dredging operations. Analysis of the data gathered during the study revealed a lowering of the water quality immediately behind the dredge. However, this condition was only temporary and was caused by the agitation of the partially decomposed sludge deposits. After the dredge has passed through an area, an improvement in the overall quality was noted. Also an increase in the average dissolved oxygen content was noted after the dredge had completed work in the area.

The second study which was conducted during routine maintenance dredging of the Bon Secour section of the Gulf Intracoastal Waterway had two purposes. The primary objective was to monitor the sediment placed in suspension during the dredging operations to prevent resuspended material from directly affecting the oyster producing areas which lie in close proximity to the existing channel. The secondary purpose of the study was to obtain knowledge of the effect of natural forces, such as wind, waves and tide, which cause resuspension of bottom sediments of this embayment. The information obtained during the study was very revealing, indicating that (1) sediment deposition on the oyster producing beds was negligible and no adverse conditions were created as the spoil discharge was well controlled and sediment deposition was always within a predetermined area; (2) lateral sediment transport of spoil material from the point of pipe discharge was found to be in the range of 1,200 feet; (3) that natural forces, particularly adverse weather conditions, were a far greater contributor to overall sediment movement in the area than was the dredging operation.

There are over 40 miles of ship channels and about 25 miles of Gulf Intracoastal Waterway in the Mobile Bay area. Maintenance dredging is required annually to keep the channel to its authorized 40-foot depth and 400-foot width. Maintenance dredging is presently in progress in the lower portion of the bay and a contract is expected to be awarded for maintenance work in the upper portion of the bay and lower portion of the river early this year. Spoil material taken from the outer bar channel is transported to deep water for disposal in the Gulf of Mexico by hopper dredge while spoil from the bay channel is pumped by hydraulic pipeline dredge a distance of about 2,500 feet to either side of the channel where it is dumped in open water. Dredging from the river channel is pumped to fast land on the east side of Blakely and Pinto Islands where it is deposited in diked disposal areas. In the Gulf Intracoastal Waterway in Bon Secour Bay which forms the easternmost part of Mobile Bay, maintenance dredging is required only about every four years to maintain the 12- by 125-foot channel. Spoil from this project is deposited along and approximately 1,000 feet south of the edge of the channel.

Section 10 of the River and Harbor Act approved 3 March 1899 prohibits the placing of any structure in or over navigable waters or excavating from or depositing material in such waters, unless the work has been recommended by the Chief of Engineers and authorized by a Department of Army permit.

P. D. Sontag

The determination as to whether a permit will be issued is based on an evaluation of all relevant factors, including the effect of the proposed work on navigation, fish and wildlife, conservation, pollution and the general public interest.

Under our procedure, copies of public notices on permit applications are sent to all interested parties and appropriate Federal and State agencies. Their comments are considered in the processing of permits. On pollution problems associated with dredging operations, full coordination and collaboration with all Federal and State agencies is carried out. This applies to the Corps new work and the maintenance channel dredging as well as to that of any of the permittees for any similar operations.

As stated previously, control of water pollution is one of the Corps' goals in the development and maintenance of navigable waters. It is felt that progress has been made in providing protection for the shellfish producing areas. However, we still believe that much more can be done. In this area the Corps is looking to other agencies for assistance and guidance, particularly to the Department of the Interior through the Federal Water Pollution Control Administration and its Fish and Wildlife Service. Considerable time, effort and funds have been expended in the development of our natural resources for their best use. Accordingly, we will continue to study and analyze present operations in order to improve dredging techniques so that all purposes will best be served.

Mr. Chairman, that concludes my statement.

MR. STEIN: Thank you, Colonel Sontag.

Are there any comments or questions?

MR. WHITE: Yes, Colonel, I would like to ask one question. I believe you stated that you are pumping your material that you get from the upper bay area, I don't remember the precise language, but approximately 2,500 feet away from the channel?

LT. COL. SONTAG: That is correct.

MR. WHITE: And fanning it out? How long has this practice been observed? Have you been doing this for some length of time?

LT. COL. SONTAG: Yes, we have. Exact time I can't give you offhand. I can get the answer for you.

MR. WHITE: Very good. Because we had brought out this point of channelization before and possibly that could be the result, I presume, of some real old deposits. But this is something that we can get in the record and I would appreciate it if you would tell us how long this has been the practice.

LT. COL. SONTAG: All right, sir.

Is that all?

MR. STEIN: Are there any other questions?

If not, I would just like to call your attention to one sentence here. By the way, as many of you know, the Corps of Engineers is a Federal water pollution control and water quality agency and works very closely with us on water resources.

But when Colonel Sontag talked about his dredging operations on Chickasaw Creek he said, "This area receives a particularly heavy industrial load and bottom sludge deposits were prevalent."

I think the inferences there are plain that there is material from the industrial operations getting into our waterways and what we are doing is spending public funds to maintain the channel to remove these materials to keep the channels open. We have had this in many areas of the country where we talk about this dredging. Channels are often kept open for the use of industry and that is the way it should be. We need commerce and certainly have to move forward for it in this country. That is the premise on which the country is based. The Corps is doing a magnificent job. But very often it seems ironic that our sister agency, the Corps,has to go in and clean up a channel that is threatened with being closed by an industrial load, in order that the industry that is creating the problem by depositing its material there will receive the benefit of ships being able to go in and out stocked with raw material and finished products.

Any other comments or questions?

If not, thank you very much.

LT. COL. SONTAG: Yes, sir.

MR. WHITE: Mr. Chairman, I have one other Federal representative who indicated he would like to make a very short statement. This is Dr. Nelson R. Cooley with the U. S. Fish and Wildlife Service from Gulf Breeze, Florida.

DR. NELSON R. COOLEY
FISHERY BIOLOGIST (RESEARCH)
U. S. FISH & WILDLIFE SERVICE, BUREAU OF COMMERCIAL FISHERIES, PESTICIDE FIELD STATION
GULF BREEZE, FLORIDA

DR. COOLEY: Mr. Chairman, I would like to thank the conferees for the opportunity to make this statement.

I am Dr. Nelson R. Cooley, Fishery Biologist (Research), U. S. Department of the Interior, U. S. Fish and Wildlife Service, Bureau of Commercial Fisheries Center for Estuarine and Menhaden Research, Pesticide Field Station, Gulf Breeze, Florida. I am representing the Director of Region 2, Bureau of Commercial Fisheries.

The Bureau of Commercial Fisheries has a continuing interest in the area under discussion at this conference, particularly the effects of pesticides and siltation damage from the recent hurricane. We are currently assisting the State agencies concerned by way of grants of funds under several Federal laws.

In Alabama, we support an estuarine pesticide pollution monitoring program under contracts provided by the National Estuarine Pesticide Pollution Monitoring Program. These contracts are with the University of Alabama Marine Laboratory at Bayou La Batre, and the Alabama Department of Conservation Laboratory at Dauphin Island. In general, levels of chlorinated hydrocarbon pesticides in monitored oysters from our stations have been below 1 part per million. That is wet weight body tissue. And incidentally, I might point out that so far as we know, these levels are not of significant health influence as far as man is concerned.

We are currently doing laboratory studies to determine the effects of long-term exposure to sublethal levels of pesticides to oysters and other commercially important animals. Last fall a grant of $20,000 was awarded under Section B, the disaster relief section of Public Law 88-309, to cover the cost of replanting shell on Alabama oyster reefs, many of which were damaged or destroyed by Hurricane Camille. In addition, the Bureau of Commercial Fisheries supports a program funded under the Anadromous Fisheries Act. Details concerning any of these programs can be obtained from Mr. Johnny Crance, of the Alabama Department of Conservation, and Mr. Hugh

McClellan, University of Alabama Marine Laboratory.

I will be glad to try to answer questions concerning our efforts in Mobile Bay, if there are any.

MR. STEIN: Thank you, Dr. Cooley.

Are there any comments or questions?

If not, thank you very much, sir.

DR. COOLEY: Thank you, sir.

MR. STEIN: Before we recess for lunch, I would like to give you our schedule.

We will reconvene at 2 o'clock and expect to go until about 5 today. After lunch we would expect to hear from Alabama and its invitees.

With that we stand recessed until 2.

(NOON RECESS)

AFTERNOON SESSION

TUESDAY, JANUARY 27, 1970

(2 o'clock)

MR. STEIN: Let's reconvene.

We will now call on Alabama. Dr. Myers.

DR. IRA L. MYERS, CHAIRMAN
ALABAMA WATER IMPROVEMENT COMMISSION
MONTGOMERY, ALABAMA

DR. MYERS: Mr. Chairman, on behalf of the Alabama Water Improvement Commission, we have Mr. Charles Kelley, Chief, Game and Fish Division of the State Department of Conservation, representing Mr. Bill Graham, the Vice-Chairman of the Commission. Do you want to stand up, Charles?

We also have two other members of the Commission here. Mr. Coil and Mayor Sellars of Robertsdale I believe are the only others that I see.

On behalf of the Commission we have asked Mr. Joseph Crockett, Director of the Technical Staff, Water Improvement Commission, to make the presentation for the Commission and make a statement this afternoon.

Mr. Crockett.

J. L. CROCKETT, JR., DIRECTOR
TECHNICAL STAFF, ALABAMA WATER IMPROVEMENT COMMISSION, MONTGOMERY, ALABAMA

MR. CROCKETT: Mr. Chairman, Mr. White, Dr. Myers.

I was gratified to see that some of the conferees and many of the audience participated in eating the delicacy that we are here today in an attempt to protect.

I am J. L. Crockett, Jr., Director, Technical Staff, Water Improvement Commission.

The Federal Water Pollution Control Administration is to be complimented on its comprehensive and definitive analysis of the matter of bacterial pollution of Mobile Bay and the effects on shellfish harvesting. This analysis has been based on extensive studies by the Water Improvement Commission and Alabama State Health Department dating back to 1949 in addition to recent studies performed by FWPCA.

The report recognizes the extraordinary progress made by municipalities and industries within the Mobile area in pollution abatement over the past 20 years. It is of significance that prior to 1949, 87.5 percent of municipal wastes discharged to Mobile Bay and its tributaries was untreated with the remaining 12.5 percent receiving primary treatment only. At that time, there was no treatment of industrial wastes. Today, 97 percent of municipal wastes is receiving secondary treatment and construction is under way which will provide this high degree of treatment for the remaining 3 percent. All municipal wastes receiving secondary treatment are disinfected except the discharge from the city of Chickasaw's lagoon. As the FWPCA report reveals, there are a few deficiencies which should be corrected. As will be brought out later by me and by others to follow, plans for correcting these deficiencies are under study or will be initiated.

Sources of sanitary wastes other than municipal systems discharging directly to Mobile River or Bay include Alabama State Docks, Alabama Dry Dock and Shipbuilding Company, commercial properties along the U. S. 90 causeway and subdivisions along the Baldwin County shore. Alabama State Docks and Alabama Dry Dock and

Shipbuilding Company have studies under way for abatement of their pollution and, we understand, will complete necessary facilities by or before February 15, 1973, the date set by Alabama's plan for implementation of pollution abatement measures. The Baldwin County Health Department is actively and forcefully engaged in a program, in cooperation with the Water Improvement Commission, to secure secondary treatment and disinfection of wastes from commercial installations along the causeway to replace inadequate septic tank installations.

We concur in FWPCA's recommendation that sewerage systems, including secondary treatment facilities, be installed by Bayou La Batre, Daphne and Satsuma. Bayou La Batre has received commitments of grants from FWPCA and the Department of Housing and Urban Development to assist the city financially in the construction of a waste collection and treatment system. We certainly hope that local opposition to this vital improvement has dissipated and the plan presently proposed will be carried to completion. We also hope that the citizens of Satsuma will reconsider their opposition to a community system and that Daphne will soon be in a position to finance its system.

We also concur in FWPCA's recommendations that more effective disinfection be provided at the city of Mobile's Threemile Creek sewage treatment plant and that problems involving the city's Eslava Creek plant be resolved through expansion of facilities or redirection of waste flow. During 1968, the Water Improvement Commission directed the Mobile Board of Water and Sewer Commissioners to perform studies to solve problems at the Eslava Creek plant. I am sure you will be given more information about progress by the Mobile Board concerning the Eslava Creek plant later on this afternoon.

Regarding disinfection of the city of Chickasaw's lagoon effluent, chlorination of the discharge from lagoons involves technological problems of some magnitude because of exceedingly high concentrations of algae. Recognizing these problems and the higher and more dependable efficiency of lagoons in reducing bacteria, we have not required disinfection when this type of facility has been used.

In the interim following field studies and investigations by FWPCA, we have learned that the city of Fairhope's sewage treatment plant is grossly overloaded following rains and the overall performance of the plant is such that expansion is urgently needed. This city has engineering studies under way, and we are confident that appropriate remedial steps will be taken.

The FWPCA report does not mention disposal of sanitary wastes from vessels engaged in interstate and international shipping while in the Port of Mobile. We also understand that crews of ships undergoing repairs at Alabama Dry Dock and Shipbuilding Company frequently reside on board while repairs are being made. Inadequately treated wastes from vessels are sources of pollution and while not a major factor contributing to bacterial pollution of Mobile Bay are not an inconsequential source.

As previously stated, there was no treatment of industrial wastes in the Mobile area prior to 1949. Since that time, Scott Paper Company has constructed secondary treatment facilities and International Paper Company and Stone Container Corporation installed primary treatment units. Following passage of the 1965 State water pollution control law, the Water Improvement

Commission directed Haas-Davis Packing Company, International Paper Company, National Gypsum Company, Ruberoid Company and Stone Container Corporation to provide secondary treatment for their wastes. Haas-Davis Packing Company now provides primary treatment for its waste prior to discharging to Mobile's Threemile Creek secondary plant for final treatment. International Paper Company has notified the Commission that secondary treatment facilities will be completed by 1973. National Gypsum Company completed primary units ahead of schedule and will install secondary treatment units by 1973. Ruberoid Company's proposal approved by the Commission calls for completion of pollution abatement facilities during 1971. Stone Container Corporation's secondary treatment plant is scheduled for completion during the latter part of 1970. Other significant industries in and near Mobile, namely Courtaulds, Diamond Shamrock, Shell Chemical, Stauffer Chemical and Union Carbide are operating under permits issued by the Commission.

The Commission has notified seafood processing industries in Bayou LaBatre to abate pollution attributable to their wastes and its staff is working with these industries on solutions to their problems. We appreciate the position taken by FWPCA on treatment of wastes from seafood processing industries and concur with their recommendations.

We agree that sanitary wastes should be separated from industrial wastes so that sanitary wastes having public health significance can be adequately disinfected where required. We do not agree that wastes from pulp and paper production, in the absence of sanitary wastes, are of health significance simply because they may contain bacteria. In other words, we feel that disinfection of pulp and paper mill **wastes** would be an unreasonable imposition unless it can be demonstrated that bacteria in these wastes are of human origin or of public health significance.

There have been expressions from interested citizens that pollution from upstream sources was a contributing factor to bacterial quality of Mobile Bay. We can announce with gratitude that the nearest contribution of sanitary waste to the Tombigbee-Warrior system with less than secondary treatment is from Tuscaloosa at a point 316 miles upstream from Mobile. Upon completion of plants under construction by Cordova and Northport and Tuscaloosa's proposed improvements, there will be no discharges of municipal wastes directly to the Tombigbee and Warrior Rivers after less than secondary treatment. With respect to the Alabama-Coosa system, all direct discharges of municipal wastes to the Alabama and Coosa Rivers with less than secondary treatment will be removed upon completion of plants at Montgomery and Centre in 1970.

On the basis of the vast quantity of bacteriological data we and others have accumulated on Mobile Bay and its principal tributaries, in addition to studies of a year's duration on five streams completely free of municipal or industrial wastes, we have stated that even with the highest degree of treatment and disinfection of municipal waste discharges, it is doubtful that bacteriological criteria presently applied to oyster-producing waters can be met during periods of high river flows. It is noted that FWPCA makes the same expression in its report.

In conclusion, we agree with Recommendation No. 5 in the FWPCA report that the fecal coliform criterion be employed for oyster harvesting and that a technical committee be created to develop an acceptable numerical criterion.

Thank you, sir.

MR. STEIN: Thank you, Mr. Crockett, for an excellent statement.

Are there any other comments or questions?

MR. WHITE: I have a couple of questions, Mr. Crockett.

As you noted in our report, the Scott Paper Company has secondary facilities available but it only operates it part of the year. When will you require full operation of this facility?

MR. CROCKETT: In our plan of implementation we have stated that there would be fulltime operation of secondary treatment units located on Chickasaw Creek. We have not advised Scott Paper that it immediately begin to operate the secondary treatment facilities during the winter months--this is generally beginning around the 15th of November or 1st of December, extended through March--frankly because we have other more significant waste sources that have yet to reach the secondary stage of treatment.

MR. WHITE: You pointed out in here something that we didn't really find out in our survey here, that Fairhope needs to expand its treatment facility. Will this be completed by the implementation date which you give here, February 15, 1973?

MR. CROCKETT: Under the present stage of negotiations with the city of Fairhope, I can assure you that that date will be met.

MR. WHITE: And one other thing under the downtown interceptor, possibly, just for the record, when will this be completed, the interceptor to the McDuffie Island treatment plant?

MR. CROCKETT: I believe if you will hold that question for the representative of the Mobile Board of Sewer Commissioners that he can give you the exact date. The latest information I have is somewhere around 50 or 60 or 70 percent complete.

MR. WHITE: I have one other question as regards to septic tanks. I was trying to correlate between our board and your statement as to what facilities will provide additional treatment. Will all industries which are using septic tanks for their domestic wastes be required to provide treatment?

MR. CROCKETT: I think if you will examine--I am not suggesting this, John, but rather let me say this, if I am not badly mistaken our water quality standard criteria require that this be done, and if I am not too far off, in the event that water uses demand becomes excessive, then they would have to chlorinate. In other words, unless they separate the sanitary wastes from the industrial wastes, they are faced with chlorination of the total amount.

Now, as I understand, I think again it will be reported to you a little later on that both companies, International Paper and Scott Paper, have undertaken or have studies under way now to separate the wastes. Certainly this is a logical choice to take in these cases.

MR. WHITE: Thank you. I just wanted to bring some of these points out.

MR. STEIN: Mr. Crockett, let me clarify one point before we go into the questions I have, but there was one point raised by Mr. White.

I wasn't quite clear when Scott Paper was going to operate its secondary treatment. Can you come up with a date?

MR. CROCKETT: I didn't give you a date.

MR. STEIN: I know. I didn't mishear. But here--

MR. CROCKETT: I will say, personally, I will give you a date, by February 15, 1973.

MR. STEIN: All right. Now let me read your statement or let me see if I understand you because I think I do now.

You say Scott Paper Company has constructed secondary treatment facilities, and International Paper and Stone Container Corporation installed primary treatment. The Water Improvement Commission directed International Paper and Stone Container to provide secondary treatment for their wastes. But these are not going to be completed until or have to be in operation until February 1973.

Now, the fact is that Scott Paper Company having had secondary treatment now isn't going to mean a thing to that water any more than the other companies, since they are not going to put it into operation sooner than the other companies. As far as you are concerned, they can just let it sit?

MR. CROCKETT: No, I am not satisfied in my own mind that during the wintertime that they are actually contributing the--we know by tests, by our own tests, that they have contributed bacterially. Scott is a much less contributor by reason of--

MR. STEIN: That is right, but how about during the summer?

MR. CROCKETT: During the summer? Why do we say we require them to operate in the summer? We come back to a dissolved oxygen point of view at that time.

MR. STEIN: In other words, you are going to require Scott to start operating this summer; they have been operating in the summers?

MR. CROCKETT: Oh, yes. Oh, yes. Scott operates the secondary treatment facilities. Now, this may vary from one time to another from, let's say, the 1st of April or May to around November, sometimes beyond the 1st of November. These are operated every year. The only time that they have ceased to operate secondary treatment facilities is during the period generally speaking from November 1 through sometime in April. This was the permit originally issued to Scott and we recognize this. The secondary treatment facilities were required of Scott in order to reduce their BOD load during the critical summer season. We have full knowledge that other significant sources were not doing any more than that.

MR. STEIN: In other words, where we have the phrase, where it says "Scott Paper Company has constructed secondary treatment facilities," we should read after that in our own mind, "which they operate on a seasonal basis?"

MR. CROCKETT: "Currently operated on a seasonal basis," correct.

MR. STEIN: That is interesting--

MR. CROCKETT: The first part of it was an historical review, bringing you up to date on what we have been doing.

MR. STEIN: Yes. Well, I tell you, I don't know that I am familiar with any other secondary treatment facility in the country that is operated on that basis in any other place. It is a very interesting development and I am glad to get that.

I do want to say that when we went into this study in Mobile Bay we discovered, at least I discovered, that Mr. Crockett, Mr. Beck, Dr. Myers and Ed Roop had as much information, had done as much work and as much thinking about Mobile Bay as any group. This is something I want to make clear, that a good deal of the work that I think any of us are able to achieve on Mobile Bay has been due to that analysis and the continuing analysis and appraisal of the situation by the Alabama water pollution control authorities. As a matter of fact, I am pretty sure that we would have needed a much more extensive Federal survey to get where we are if this work had not been done. I am not sure that we could have achieved it at all without the work of Alabama, because these people have been living with this problem for a long time. I have no reservations on that at all.

However, I notice a possible discrepancy in views, maybe diversion of views, between Mr. Crockett's statement and the Federal recommendations. I would just like to surface them now because the pulp and paper companies particularly may want to say something about it in their testimony. I think the key question is going to be where we go in this area, i.e., the whole question of the disinfection of pulp and paper wastes and whether you run secondary plants on a year-round basis, which are tied in.

I think the key problem or the point of view that Mr. Crockett expressed for Alabama is, and I quote: "In other words, we feel that disinfection of pulp and paper mill wastes would be an unreasonable imposition unless it can be demonstrated that bacteria in these wastes are of human origin," and then he added a phrase, "or of public health significance." With that in mind, as far as I understand that, let me say this isn't the only place, as the members of the pulp and paper industry know, that we have run up against this problem.

The problem is that these coliforms are used as an indicator of pollution, and the supposition is where these coliforms are indicative of sewage from a city, say packinghouse wastes, pathogenic organisms may be present. Therefore, you have to, say, disinfect the wastes or do something to make those pathogenic organisms innocuous. However, when the coliforms come from pulp and paper wastes, the argument has been that this is not necessarily so. As a matter of fact, some people say it is kind of bizarre to suppose that you are going to have pathogenic organisms in pulp and paper wastes.

I think, again, I have no firm views on this and certainly none as relates to this area. I do know that some people say in the examination of these wastes they have found salmonella and other pathogenic organisms when they have examined these. But I am not sure we want to go into this "public health significance."

No one is going to ask, I think, that any waste, including pulp and paper waste, be disinfected just for the purpose of disinfecting it. However, if pulp and paper wastes interfere with the water use--and certainly the raising and harvesting and eating of shellfish is a legitimate water use--or any other water use like recreation, and if disinfection would be the appropriate kind of treatment, I think we can agree we would have disinfection or whatever else.

This is not saying that pulp and paper wastes carry pathogens or carry materials which after secondary treatment require disinfection. Is this correct? I am trying to say what you are saying, I think, and put us both together. I think we both agree that if they interfere with the water use, then something has to be done about it.

MR. CROCKETT: No, I said my position is that if the bacteria contained in wastes generated by the production of pulp and paper from hardwood, wood chips and what-have-you can be demonstrated to have bacteria of human origin or of public health significance, then I will take the position of this disinfection.

MR. STEIN: Well, here I raise another point. I agree with you here. These are two points we have to raise.

One, it is not necessarily a question, I think if they interfere with any water use it is a--now, whether you want to consider that "public health significance" or not, I don't know if you are going to--you may think the public health is satisfied once you have the oyster beds closed or something off limits to fishing, but if they interfere with the water use and that water use can be restored by disinfection, then you presumably are going to ask for disinfection.

MR. CROCKETT: I wish I were more familiar with the shellfish bacteria standards. I seem to recall somewhere--it has been quite a time since I read it--that the standards would not necessarily apply if it could be demonstrated that sources of sewage were not causing the concentrations.

MR. STEIN: I didn't hear that this morning from the Federal people, but, Joe, that is the way I recall it.

MR. CROCKETT: Yes.

MR. STEIN: But the point is it doesn't matter where the pathogens come from, whether they are from sewage or not. Let's put it this way. If we can get a disease-transmitting organism that comes from a warm-blooded animal, say from a packinghouse plant, it doesn't have to be a sewage treatment plant. Now, if on the other hand investigators--and I do not want to single out pulp and paper industry, but if you can visualize, say, sugar beet wastes, pulp and paper wastes, steel mill wastes, oil well wastes, petroleum wastes, anything of that kind, containing a toxic or a pathogenic substance, wherever that comes from, you are going to use your means to correct it; but it has to be demonstrated that it is in that waste.

MR. CROCKETT: I would agree. My position in the statement is simply that if we have so many total coliforms or so many fecal coliforms in paper mill wastes, do we require disinfection? I took the position or have taken the position that we would not unless it could be determined that these were of this origin.

MR. STEIN: Let me tell you what has happened in other cases. Where that has happened the investigators in a few cases have gone a little bit further and I think a couple--at least one of the companies is represented here where this has happened in investigating those wastes. They discovered, for example, that salmonella, at least to the investigator's satisfaction, were in the pulp and paper wastes and we did get a requirement that disinfection be practiced on these pulp and paper wastes.

In one of these we had a rather major plant in a real large city, and to the best of my information this company suspended pulping operations there.

Now, that wasn't done by the regulatories based on coliforms alone. They found something beyond coliforms. But the question is if you find a pathogenic organism, you make a move to try to get it out.

MR. CROCKETT: Correct.

MR. STEIN: You have raised one other point and I think this is a very subtle one and a correct one, though. The question here is are pathogens due to the pulping operation. I am not sure anyone has been that refined yet. All these places, particularly these large industries, have their own ways of getting a water source.

I don't know if we find pathogens in that or material that we would have to keep out beyond coliforms; and I agree you have to go beyond just a broad coliform classification--that these materials come in from a pulping situation necessarily. They may be taking them from the wrong water supply. The question is, if a company takes this in in their raw water supply and they are putting material out that contains a pathogenic organism, how are we going to say, just because they took it in with the raw water supply, whether you are going to be required to disinfect or not disinfect on that basis, or, as a matter of administrative efficiency and regulation, that we have to ask that disinfection be required of all effluents wherever the source contains pathogenic organisms. By the way, I am not attempting to answer this question, but I am indicating some of the tough problems we are going to deal with. This is something you may want to keep in mind in your testimony.

I submit to all of you people that we have some very, very far-reaching and delicate questions here, and I think that Mr. Crockett alluded to these. There is one thing we certainly can't do. I don't think we can come up with an oversimplified or simplistic solution to this, because these are very complex and very difficult problems.

All right.

MR. CROCKETT: May I make a comment?

In the FWPCA report it was stated that

International Paper takes its water from Chickasaw Creek in a polluted section. I may be subject to correction by representatives of International Paper, but I believe this is flume water that is recycled. The major portion of their process water does come or has been coming from the reservoir of the city of Mobile and perhaps some of it is coming from the new water intake on Mobile River at the moment.

Scott, unless they have changed, has not taken any water from Chickasaw Creek. It is coming through the Mobile industrial water system, which I think is now combined with the Mobile Water Improvement Commission. Perhaps if this be a source of some pathogenic bacteria it would make it much more easy to chlorinate the process water than it would be to try to get the lignins and all the other associated materials out of the pulp and paper wastes.

MR. STEIN: That is right. It may cut the coliform count down if they do chlorination in advance rather than later.

MR. CROCKETT: This might be--

MR. STEIN: Now, the originally related

question--just one last thought before we go on. Obviously this whole question of disinfection of pulp and paper wastes is going to relate to the number of coliforms we have in the bay. It seems to me the predication of the relatively low numbers of coliforms you might have was based on the assumption that the recommendations in the Federal report would be followed and there would be a year-round chlorination of the pulp and paper mill wastes. If this is not done, then presumably you would have to go back to the Public Health Service with much higher coliform counts and this might be a more difficult thing to get them to agree to where they have these rather high counts and being able to attribute these to benign sources. So I think this is another aspect that we really have to think about before we can find our way through to a solution.

And please understand me from Alabama, I am not putting this in contention or opposition. It is just that we both have to work out the problem and I don't intend at this stage to have a conclusion or even know the answers on that.

MR. CROCKETT: You had said earlier, Mr. Stein, that this is a very complex problem. I thoroughly agree and I think a great deal of thought and study is going to have to go into it before we find the answer.

MR. STEIN: Thank you, Mr. Crockett.

Any other questions?

Thank you for a very good statement.

Dr. Myers.

DR. MYERS: Mr. Chairman, I want to deviate from the usual listing in order to give opportunity for two people to speak at this time. The League of Women Voters has asked to make a brief presentation, and I believe that Mrs. Verda Horne is still here if she wants to come and make her presentation now.

MRS. VERDA HORNE
CHAIRMAN FOR WATER RESOURCES
LEAGUE OF WOMEN VOTERS
MOBILE CHAPTER - MOBILE, ALABAMA

MRS. HORNE: Dr. Myers, Mr. Stein, Mr. White.

I am Verda Horne. I am Chairman for Water Resources for the State League of Alabama Women Voters. I am also Chairman for the Mobile League.

I would like to deviate from my statement just to remind you that I am cognizant of the seriousness of this occasion. When Mr. Stein could refer to opening up the beds and nobody even laughed, I know it is a serious occasion indeed.

The Mobile League of Women Voters, separately and in cooperation with the State and national League, has supported continuing action to improve the quality and management of the water resources in the United States. It is the consensus of the local and State Leagues that Alabama's water resources must be protected and carefully managed, and that the quality of the waters, particularly in the vital estuarine and coastal areas, must be improved.

The Mobile League is convinced that the improvement of the coastal waters is an obligation that citizens will support financially, in the full knowledge that the penalty for failure falls unfairly upon a small segment of the population, but places in jeopardy the health and welfare of all of us.

The League has worked conscientiously to increase the Federal and local funds available for municipal treatment of wastes; it stands ready to give more than lip service to legislative and congressional efforts for pollution control and abatement; it affirms a policy of insuring that the cost of improving the quality of water be the responsibility of those who pollute it, be they institutional, industrial or municipal. Efforts in this direction have begun; we believe they should be vastly augmented and accelerated.

Most sincerely.

Thank you.

MR. STEIN: Thank you very much, Mrs. Horne.

Are there any comments or questions?

If not, thank you for that statement.

DR. MYERS: I would like to call on Dr. W. L. Mallmann, representing International Paper Company, because he, I believe, has to catch a plane.

DR. W. L. MALLMANN
DEPARTMENT OF MICROBIOLOGY
MICHIGAN STATE UNIVERSITY
EAST LANSING, MICHIGAN
(CONSULTANT, INTERNATIONAL PAPER COMPANY)

DR. MALLMANN: I am Dr. W. L. Mallmann, Professor Emeritus, Professor of Microbiology and Public Health at Michigan State University, and have been interested for many years in the methodology of detecting pollution in water. I have been asked to present this by the International Paper Company.

MR. STEIN: By the way, Dr. Mallmann, do you have a written statement for the reporter?

DR. MALLMANN: Yes, I will give it to you.

MR. STEIN: Right. Thank you.

(Off the record.)

DR. MYERS: We have a procedural change. I think it will be a little more understandable for those of you who are listening, too, to hear Mr. Paisley Livingston of the International Paper Company and then the Professor's remarks will be a little more understandable and in a little more logical sequence.

PAISLEY LIVINGSTON, ASSISTANT MILL MANAGER
MOBILE MILL, INTERNATIONAL PAPER COMPANY
MOBILE, ALABAMA

MR. LIVINGSTON: I apologize for the misunderstanding.

Mr. Chairman, members of the Federal Water Pollution Control Administration and the Alabama Water Improvement Commission, ladies and gentlemen.

I am Paisley Livingston, Assistant Mill Manager of the Mobile Mill of the International Paper Company.

International Paper Company operates a pulp and paper mill, a paper bag factory, and multiwall bag factory in Mobile, Alabama. Mobile is also the headquarters of our Southern Kraft Division and our Woodlands Operations for the South. We employ some 3,500 people with an annual payroll of approximately 38 million dollars.

It is International Paper Company's stated policy to cooperate with local, State and Federal pollution abatement officials in controlling wastes that are generated at our facilities. We have previously written Dr. Ira Myers, Chairman of the Alabama Water Improvement Commission, that we will have secondary waste treatment of our process liquid wastes in operation by 1973. We have been requested by the Commission to improve this completion date and wish to assure you that we will endeavor to complete this project by 1972.

During the past year we have completed several projects within the mill which have minimized the quantity of water used per ton of product in our processes. At present we have under construction modernization of our bleaching facilities which incorporates the most recent concepts of water reuse to further reduce our total usage of water and considerably reduce BOD in our wastes.

In the report published by the Technical Services, Southeast Water Laboratory, Southeast Region, Federal Water Pollution Control Administration, Athens, Georgia, in August 1969,Recommendation 2 deals specifically with industrial sources and treatment of their wastes.

This recommendation reads as follows:

"A" - Separation of process and domestic wastes.

"B" - Secondary treatment at not less than 85 percent removal efficiencies and effective disinfection at all times for domestic wastes or connection to the municipal sewer system.

"C" - Secondary treatment at not less than 85 percent removal efficiencies for process wastes and effective disinfection at all times.

With respect to "A", at the present time not all domestic wastes are separated from the process wastes. International Paper Company agrees to separate all such waste by the time of completion of our secondary waste treatment facilities. This will be accomplished by connection to a public system, or construction of a separate treatment facility to handle sanitary waste.

Under Part "B", the level of BOD removal required in facilities treating sanitary waste is determined by the State regulatory agencies. We agree to meet

State regulation requirements should we find it necessary to construct such a facility. The requirement of effective disinfection of all wastes which are obviously of sanitary significance is an important public health policy and we endorse this position.

Part "C" deals with the question of BOD removal and sanitary quality of process wastes. We have had many discussions with the staff of the Alabama Water Improvement Commission on the requirements for BOD removal at the Mobile Mill. An agreement was reached on treatment requirements consistent with the objectives of the water quality standards promulgated by the Commission and approved by the Secretary of Interior. We have agreed to completion of these secondary facilities by 1972, one year sooner than originally requested. Plans and specifications for the completion of this work have been under way for sometime with construction scheduled beginning in this summer of 1970. We believe the BOD removal requirements should be established by the primary control agency, in this case the Water Improvement Commission, because their staff has the basic data necessary for determinations. The report provides no basis for the recommendation of a specific level of BOD removal from any source.

The importance of the bacteriological levels from a public health standpoint is the prime concern. The mean values reported in the August report have resulted in Recommendation 2 which suggests that all wastes should be disinfected, and, at the same time, Recommendation 5 suggests that the standards used and the indicator organism may be misleading from a public health point of view.

International Paper Company does not believe that our process wastes are of public health significance. We are aware that certain of our unit processes involve a source of and an environment for the reproduction of the types of organisms which will appear to be positive indicators of sanitary significance under the testing procedures used by the investigators. However, a more complete analysis of such organisms using both the coliform and the so-called fecal coliform test at locations where the absence of domestic waste has been established has shown that the organisms are of the Aerobacter Aerogenes type rather than the E. Coli type and therefore **are** of no sanitary significance.

The testing procedure used by the Federal investigators will show a high indicator count for the following unit operations:

1. Wood storage
2. Woodroom or processing
3. Groundwood mill
4. Paper machine sewers
5. Starch preparation area

Bacteriological testing and its limits, particularly with respect to indirect measurements of significance, is defined by carefully established procedures which can be duplicated by qualified people. However, in the normal course of establishing so-called coliform standards, frequently some of the limitations and cautions associated with the development of the test are dropped, forgotten, or the standard is used out of context. We believe the standard is being used out of context in this case. It would appear that the Federal report is essentially intended to be a sanitary survey of the water and the discharges to the water. We can detect no indication that the sanitary significance of our industrial discharge has been established by the investigators. We feel it is necessary to establish the sanitary significance of tests on industrial discharges before placing disinfection requirements on such discharges.

We have requested that a widely recognized authority in sanitary microbiology, Dr. W. L. Mallmann, expand on these last points in some detail.

With your permission I would like to introduce Dr. Mallmann at this time.

MR. STEIN: Let's see if we have any comments or questions on your material first, Mr. Livingston.

MR. LIVINGSTON: Fine.

MR. STEIN: Are there any comments or questions?

When in 1972 are you going to complete these plants?

MR. LIVINGSTON: We are saying by January 1, 1972.

MR. STEIN: January 1, 1972? And you are going to put them into operation as soon as they are completed?

MR. LIVINGSTON: That is the plan.

MR. STEIN: During the winter? You are not going to wait until the summer?

MR. LIVINGSTON: I have not been advised to the contrary.

MR. STEIN: Well, that is interesting. Maybe that policy will be catching.

Now, there was one thing I would like to point out, and of course you have every right to say this, but this has been said for a long time by industry. And again as I have pointed out, when industry says this, that is not necessarily but one of the indicators that they think there may be problems with the Federal Government. That is the stated operation is that, "We agree to meet State regulation requirements by the primary control agency, the Water Improvement Commission, and so forth."

As I pointed out, as far as I am concerned we are working very closely with the Alabama Water Pollution Control Commission, and if I have anything to do with it there is not going to be any difference between the requirements of that Commission and the Federal

Government. But I would like to point out to everyone here that the Secretary of the Interior has called this case and there are Federal requirements as well as State requirements. We don't expect them to be any different, but I think if we are going to proceed on this we have to recognize there are two sets of requirements.

MR. LIVINGSTON: Yes, sir.

MR. STEIN: Now, again you raised one question and I am not arguing this at this point. When you are talking in terms of secondary treatment you are not necessarily equating that with 85 percent removal.

MR. LIVINGSTON: I beg your pardon? I didn't understand what you said.

MR. STEIN: When you are talking in terms of secondary treatment, certainly in this statement International Paper is not necessarily equating that with 85 percent BOD reduction?

MR. LIVINGSTON: No, my statement was that we would meet the Secretary of the Interior's requirements.

MR. STEIN: Yes. Now, let me again say that in the past year or so in dealing with the States, both in establishment of standards, which I also am charged with, and enforcing them, and in carrying out these enforcement procedures, we no longer have been able to go backward to a recommendation for secondary treatment and let it go at that. As a matter of fact, a fair guess is that I don't think I would recommend it or even if I did I don't think the Secretary would accept it.

In other words, we are going to have to be more definite. I am not making a brief for any number, but I think the days that we in the Federal Government can make a recommendation, as we have in the past, for secondary treatment are gone. As a matter of fact, I think as we talk in these terms of advanced treatment, some people call tertiary treatment, we are speaking in terms of the number. As a matter of fact, this is a little unusual that we are speaking in terms of percent reduction, because we generally go one step further to pounds per day. The reason for that--and I will give you my view and I think this might help industry too, because I am not sure that people know what we are talking about when we talk about primary, secondary or tertiary treatment, precisely what that means. They are such rubber terms that you get a tremendous disparity of results.

For example, you can have primary treatment in certain cases with anywhere between, oh, say 10 and 50 percent BOD removal, which is quite a spread. And you can have secondary treatment from anywhere when you go up, oh, maybe to 40 to 90 with them. And tertiary treatment, anyone can tell you what that means, but generally they consider it above what you would ordinarily get in secondary. But they are not precise terms.

I think if you are going to have some industrial management or if we are going to have a Federal-State program that means anything, we are going to have to come out with some more precise numbers.

Now, again I think, sir, you and the rest of the industry can expect that we will probably try to make a recommendation in terms of something rather specific and not just secondary treatment, so the sooner we all begin thinking in terms of numbers, maybe the fewer surprises will be in store for us.

Go ahead.

MR. LIVINGSTON: I would like to introduce

Dr. Mallmann at this time.

Dr. Walter L. Mallmann, Professor Emeritus of the Department of Microbiology and Public Health of Michigan State University, has been a recognized authority on sanitary microbiology for more than 50 years. For many years he chaired the Committee on Standard Methods for the Examination of Water and Wastewater. He served that committee from 1940 until his recent retirement. He has also served as a consultant on matters of public health to the Department of Agriculture, Public Health Service and the World Health Organization.

Dr. Mallmann has been instrumental in the development of testing techniques used in sanitary microbiology. He is widely quoted by researchers in the field today. We feel that he can add measurably to the deliberations of this conference by virtue of his expert knowledge of the testing techniques, and their limitations, that have been used in the development of the conference report.

Dr. Mallmann.

DR. W. L. MALLMANN

DEPARTMENT OF MICROBIOLOGY
MICHIGAN STATE UNIVERSITY
EAST LANSING, MICHIGAN
(CONSULTANT, INTERNATIONAL PAPER COMPANY)

DR. MALLMANN: In the summer of 1944 and 1945, I was asked by the Michigan Department of Health to make a bacteriological survey of a beach on Lake Erie from the Raisin River mouth north to Sandy Creek. The Raisin River carried untreated primary effluent from the city of Monroe and discharges from three paper mills. Surface samples were collected at three feet and ten feet depths at seven points, ranging from the mouth of the Raisin River to the mouth of Sandy Creek.

Prior to these studies, Perry and Hajna had reported on E. C. medium and 45.5 Centigrade incubation for the detection of fecal coliforms. This procedure was included in the study along with lactose broth and lauryl tryptose broth for coliforms. Lactose broth was checked for enterococci by a technique reported by Mallmann in 1926. Organisms producing gas in the E. C.

medium at 45.5 Centigrade were checked by IMViC tests to catalog into E. Coli and A. Aerogenes groups.

For purposes of discussion at this time, it was found that nearly 50 percent of the organisms that produced gas in E. C. medium in 24 hours were typed as A. Aerogenes.

Our conclusion,which was a part of the above report, was that the 45.5 Centigrade test merely detected a lesser number of coliforms than were detected by lactose broth and lauryl tryptose broth at 35 Centigrade. Thus, it was a poorer detector of coliform organism for measuring the health hazards of waters which had been polluted by sewage and industrial wastes.

It must be realized that these results represented only one survey of one area and that other areas might demonstrate different results. It is quite possible that the non-fecal coliforms that grew at 45.5 Centigrade were organisms discharged from paper mills.

In 1966, Gelreich presented an edited compilation of previous reports on the significance of fecal coliforms in the environment. These papers are an excellent presentation and the data collected represent an excellent demonstration of the role of fecal coliforms as an index of human and animal pollution. Dr. Geldreich on page 15 of this report states, "A small percentage of the fecal coliform are excluded and an equal percentage of non-fecal coliforms is included at this recommended incubation temperature."

Bacteria such as fecal coliforms have an optimum growth temperature of 35 Centigrade. The maximum growth temperature in a suitable medium is approximately 10 degrees above the optimum. Thus, the maximum for fecal coliforms would be about 45 to 47 Centigrade coliform organisms of so-called non-fecal types growing in water and soil have an optimum of 30 to 32 Centigrade and a maximum of 40 to 42 Centigrade.

On a study of optimum incubation temperatures for coliform organisms by Boniece and Mallmann in 1950, coliform organisms were isolated from a shallow highly active biological lake. The optimum temperature for growth of E. Coli, A. Aerogenes and intermedia organism was 35 Centigrade. These organisms would have a maximum growth temperature of 45 Centigrade.In most streams and lakes in the northern part of the United States most of the non-fecal coliform would have an optimum temperature of 30 to 32 Centigrade. In the south, water temperatures particularly during the summer may produce conditions conducive to the growth of coliforms, both E. Coli and A. Aerogenes, so that the health significance of coliforms may change.

In a bacteriological study of a lake, Mallmann and Sypien in 1934 studied the incidence of coliforms and streptococci on a bathing beach and a control at the center of the lake during weekends of heavy bather loads. Samples were collected starting Friday night through Saturday and Sunday at intervals of three to four hours. Coliform indices on the bathing beach did not necessarily reflect bather loads. The rise and fall in numbers of coliform on the bathing beach and at control areas followed the same pattern. They state, "It must be remembered that in a water containing large amounts of organic matter E. Coli grows abundantly even in the absence of sewage or bathing pollution. The same holds true of the 37 Centigrade total count." In this lake in the winter the coliform index is less than 1 per 100 milliliters and in the summer on warm cloudy days the index may reach 5,000 to 10,000. Both *A. Aerogenes* and *E. Coli* increase in number. As would be expected, the *A. Aerogenes* count is considerably higher than that for *E. Coli.* It is interesting to note that the streptococci disappear after the bathers leave the water in a few hours.

The same condition exists in summer in Sapphire Lake, another shallow biologically active lake where I have a cottage. The only pollution in the lake comes from water fowl and wild animals. Both *E. Coli* and *A. Aerogenes* multiply in this lake.

In any survey of a lake beach, a river or a restricted shallow bay such as Mobile Bay, the survey should consist of a quantitative biological examination of the area and the sources of pollution accompanied by a sanitary survey to determine the significance of the values obtained. Where the pollution is known to be from a domestic sewage, there is little need to evaluate further than a measurement of the amount of coliform and fecal coliform content. If high coliforms appear in industrial wastes where no domestic sewage is present, a sanitary survey should be made to locate the source

Dr. W. L. Mallmann

or the significance to public health of the organisms. If high fecal coliform indices are found, tests could be made for streptococci. If the latter are in low population or absent, multiplication would be suspected in the processing procedures. If the fecal coliform counts may be due to multiplication, then the fecal coliform lose their sanitary significance.

The wash water from soil-contaminated logs with the resulting nutrients from the soil plus starches and other nutrients used in paper processes and a favorable incubation temperature of 30 to 35 Centigrade may adapt the coliform population to grow at 44.5 Centigrade. Plating these cultures, picking pure cultures and testing by IMViC would establish the proper coliform grouping.

Such examinations could be made of paper plant effluents to establish the validity of the fecal coliform tests as an indicator of sanitary significance. If these fecal coliform counts are shown not to be a measurement of the public health hazard, then the use of such fecal coliforms as measurements of health hazard of oysters has very little validity.

Dr. W. L. Mallmann

Fecal coliforms are found in relatively large numbers in animal manures, they may occur in soils, insects, wild animals but in low numbers, and they may become established in waters rich in nutrients, where multiplication may occur. The non-fecal coliforms do grow occasionally in E. C. medium and can be adapted to higher optimum growth temperatures and to higher maximum temperatures.

Fecal coliforms are good indicators of pollution when domestic sewage has been established as their source. Under these conditions, counts of fecal coliforms total coliforms and enterococci, in addition to a sanitary survey, are qualified evidence of pollution.

If we calculate the theoretical fecal coliforms of the International Paper Company in 31 million gallons a day flow for 660 employees, each discharging 2,000 million fecal coliforms, we should find approximately 100,000 per milliliters in the discharge to the river. If the discharge carries 945,000 fecal coli per milliliter, tnen we have to account for the source of 845,000. Only a sanitary survey coupled with fecal coliform counts at various stages of processing would reveal the importance of these organisms.

It would seem that this should be done before the industry is indicted as a source of sanitary pollution.

Thank you.

MR. STEIN: Any comments or questions of Dr. Mallmann?

You may have a point here, Dr. Mallmann. I don't know that anyone is indicting anyone else, but just saying that at this stage these are the things to do.

But I do think it is kind of odd, and maybe fortuitous, the choice of your examples, because it was precisely on the Raisin River dealing with those paper mills that we asked Dr. Gelreich, who you quoted as putting down this excellent study, to do this kind of job. It was on the basis of his analysis and recommendations that both Michigan and we asked the pulp and paper companies to chlorinate their effluent. And if you and the paper companies think that this is what it takes--and by the way, I for one am not advocating to make anyone do something unless there is evidence that this is going to do some good--but if this is the notion and everyone agrees to be bound by the results, I think this is at least the start of a position that we might be able to live with.

But remember, if the results come out where evidence is found of pathogenic organisms, then presumably we are going to recommend year-round disinfection.

DR. MALLMANN: Yes. I think we all agree that the isolation of a pathogen from the effluent would be evidence of pollution. Unfortunately, we haven't developed very good methods for this work. We do isolate salmonella, but in order to get them out of an effluent where they would be in low population we have to do it on a qualitative basis. And one of the unfortunate things at the present time in regard to salmonella isolations has been the fact that in many cases it has been a qualitative test rather than a quantitative test. And I still believe that we have to measure on a quantitative basis rather than qualitative in order to get--

MR. STEIN: Oh, yes. I admit the testing is difficult, but we do have the help of Ben Gelreich, but the point is even if he finds them, you are going to say this is not enough. This is the point. If you do the test and we do the test and we both find positive evidence, then do we have the controls or do we still get another argument that this test also is insufficient?

DR. MALLMANN: Yes, I think that is true.

MR. STEIN: All right. Your position is clear, I think. (Laughter.)

DR. MALLMANN: Any other questions?

MR. STEIN: No, I don't have any others.

Thank you.

DR. MYERS: Mr. Chairman, I am here in another capacity, not only as Chairman of the Water Improvement Commission, but also as State Health Officer, and I am delighted to have in the audience today members of the State Board of Health. One of my immediate bosses, Dr. M. Vaun Adams of Mobile, is here on the front row, and also there are members in the audience from the county health departments of Mobile and Baldwin. I believe if all of you who are representing the health agency would stand, both State and county health departments, I will just recognize you as a group, all employees from the

State and county health departments here in the State.

You see, Mr. Chairman, why I decided not to introduce them one by one.

Among the ones who stood are those who are charged with the, quote, sanitary survey surrounding this area. No matter what you do and how quickly you make the survey, by the time you get around some things have changed. In view of this, in view of the rapidity of change and the problems that crop up in dealing with large numbers of individuals without any body of water, and man happens to be a pretty healthy polluter by himself, then we are faced with the problem of discovering organisms in a body of water.

I have asked Dr. Thomas Hosty, Director of the Laboratory for the State Health Department and in charge of the branch labs throughout the State--we have eight of them--to come and make a presentation on the numerous studies that have been conducted by the Water Improvement Commission and the State Health Department cooperating as two joint integrated agencies.

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DR. THOMAS S. HOSTY

DIRECTOR, LABORATORIES
ALABAMA DEPARTMENT OF PUBLIC HEALTH
MONTGOMERY, ALABAMA

DR. HOSTY: Gentlemen. I sort of feel like the little boy that went swimming to come out and find his clothes were stolen. Much of my remarks are going to have to be off the cuff because I am not going to use them as they are written here, since some of this was covered by the Federal Water Pollution Control Administrator, Southeast Water Laboratory, and done very beautifully, too. I just wish I could bring out a report as well.

I think I am going to make my remarks very brief. I was a little surprised from the last paper to hear the distinguished professor say that fecal coliforms would grow in water when I just read an article the other day that said they wouldn't. But you have to take the articles for what they are worth, exactly the same way as saying that you can find Salmonella without any evidence of fecal coliform. I haven't had the chance of reading that paper, but one swallow doesn't make a summer either.

The study which I am going to talk about very, very briefly was started in 1960 and continued through 1963. During this period of time we ran over 5,000 MPN's and 10,000 entries in the course of the study. The papers which I have distributed to some of the committee will indicate the volume of work which was accomplished.

At that time we were using what was called the EC test. Technically the EC test was one of those in which you go from the positive lactose tubes to EC media and if you get gas produced, you plate out the organisms and do IMViC's to determine if it is E. coli. Later it was decided that any organism giving a positive EC test would be classified as fecal coliform regardless of whether it could be classified on IMViC test as E. coli or some other type of coliform.

In the limited time available, it is not possible to describe in adequate detail the data accumulated in our 1960-1961 study of the Mobile Bay and oyster-bearing areas. This investigation involved the weekly testing of 43 stations for three years or 5,500 coliform determinations by the three tube test. Additionally, all positive lactose tubes were reinoculated into EC media and incubated in a water bath at 44.5° ± 0.2° for 24-48 hours. For some time, after incubation, all EC tubes positive or negative were streaked to eosin methylene blue plates. After incubation, one colony conforming to the accepted morphology of E. coli, or if no such were present, a colony which came closest to being typical, was picked and inoculated into a lactose tube. From this tube the EC test was repeated along with the IMViC determinations. It soon became apparent that plating of EC negative tubes was not fruitful so the routine was altered, plating only positive EC specimens. In all some 10,000 IMViC and repeat EC determinations were performed.

As the study developed it became apparent that any one of the coliforms when inoculated into E. coli media and which produced gas was apparently as significant as E. coli itself. During this study the standard test name was changed from E. coli to fecal coliform test but the term EC will be used throughout this discussion as synonymous with the fecal coliform test.

The Mobile Bay area is roughly some 30 to 35 miles long and approximately 25 miles at its widest point. The upper part of the bay shows extreme pollution which has no effect on the Cedar Point growing areas under normal conditions. During the rainy season this immunity to contamination may abruptly change. It may be added here that during this study, Alabama experienced the worst floods in recorded history.

Figure 1 shows a general picture of the station locations as well as the normal current flow and flood pattern. A few of the upper stations, including Alabama and Tombigbee stations, are not shown in this chart. By studying the various stations it was apparent that some areas could be grouped rather than considered independently. Alphabetically, therefore, grouped or single stations were, in their descending order down the bay, starting with the Alabama and Tombigbee Rivers, designated as Group A, B, etc. In general we shall only discuss Group H, J, L and M. The station or stations represented by this grouping may be identified in the table showing probability percentiles.

Charts are included on stations 2, 4, 20, 31, 48, 87 and 119. The first two stations, namely 2 and 4, are located in the upper part of the bay including the Mobile River.

Station 31 adequately shows the high pollution usually present. The overall trends suggest diluting out of EC gas positive organisms derived from the fresh sewage discharges by fresh water during periods of increased river flow. This is apparent beginning in late October, with progressively increasing separation of the coliform and EC lines throughout the flood stage which persisted until late May. When normal river flows reoccurred, there was a return to a similar pattern of the coliform and EC MPN's.

Station 48 is included because it represents an area affected by runoff which reached a peak towards the end of March. The rhythmical pattern of coliform and EC MPN separations were disrupted when salinity decreased. The marked increase in runoff resulted in a doubled coliform count but the EC MPN was only slightly changed. This continues until recovery of normal salinities is apparent.

Some 35 miles down the bay from Station 31 we have used Station 87 as an index area. During normal salinity content in the bay the coliform count, though fluctuating, reaches sizable peaks while the EC count remains less than three. Around the 20th of March, with falling salinity, pollution occurred and there is an immediate rise in EC MPN's. The pattern of recovery shows gradual return to the usual pattern of coliform-EC relationships.

Station 119 is directly over the Cedar Point oyster area and illustrates the response of the EC test to pollution. The concurrent drop in salinity and rise in MPN's is dramatically evident.

As a matter of fact,with certain reservations one can almost forecast pollution when the salinity begins to drop. The fecal coliforms start to rise along with the coliforms,but it is quite evident that if we are to base our testing procedures on coliforms that the oyster beds would be closed from a period of five to nine weeks longer than if the fecal coliform test was used. It can be noted on Chart 119 that once coliforms rose to a high point they remained high while the fecal coliforms decreased rapidly.

The histogram summarizes in percentage the confined EC positive as compared to coliform positive tubes and shows clearly the response of EC media to pollution as compared to the accepted coliform test. You will note that during period 1 at Group G (Station 20) immediately below the discharge of fresh sewage, the EC test was 83 percent positive compared to the coliform test and there was a gradual decline until Group M (oyster bed area) was reached where only 9.8 percent of the coliform positive tubes were EC positive. During period 2, flood stage, no change in percent EC positiveness was apparent in area G. Some dilution by river water caused the reduction in percent EC positives at Groups H and J. The most striking difference occurred in the areas immediately above and over the oyster beds. Sharp increases in percent EC gas positives occurred. These can be explained by the influx of fresh water that received pollution in the Mobile area and, as shown in Figure 5, reached the oyster beds during the flood stage. The fact that travel time was considerably less during the flood stage with the associated reduction in die-off rate might also be a factor which influenced the increases in percent EC gas positiveness. It is also significant that when river discharges returned to normal low rates (recovery period), the progressive decrease in percent EC positiveness, associated with distance from pollution, was demonstrated.

Table 1 shows these same grouped stations as coliform and EC percentile probabilities. Again, as we descend the bay, improvement is noted over the oyster beds (Group M), the 50 and 90 percentiles fall well within accepted norms during the normal and recovery periods but completely outside the range during the flood stage.

During the early part of the fecal coliform studies a great deal of confusion resulted from lack of proper equipment, and indeed there is a great deal of difference of opinion as to what the incubation temperature should be. All of our studies were run at 44.5 ± 0.1 degree.

Certainly I was a little shocked to listen to a paper at the National Shellfish Shop some years ago in which the author was not quite certain that the incubation temperature was constant. Others used air incubacion and while under certain conditions these may be adequate, they appear to be far inferior to the use of the properly designed water bath. With these remarks let me briefly tell you something of the work which has been done in Alabama. Then I would like to comment on the use of the fecal coliform test.

With certain reservations over the oyster beds, all you have to do is determine the salinity and you know whether contamination is occurring or not. I do think this brief summary does show a great amount of work we have devoted in an attempt to aid the oyster industry.

I happen to be chairman of the Recommended Procedures for the Testing of Shellfish, which was sent in for printing about four months ago. Many of the tests in it are going to be inadequate due to varying environments.

Briefly, the E. coli membrane filter test has been shot down in Alabama and I don't think will ever breathe again. The other test would be the fecal coliform membrane filter method, about which I have considerable reservations. I think the tube test is a much better test.

Which only leaves us one other test, that is the enterococci, which we have not yet had enough experience in using to determine whether it would add to the effectiveness of testing for pollution in southern waters.

As far as I am concerned at the moment, the fecal coliform is the only test for Alabama. I think it is an extremely unfair advantage to go up to the Northern coast where the coliform E. coli ratio is much closer together than it is in the South. I think it was my good friend Mr. Kelley who made a remark that the fecal coliform test had saved the Southern oyster industry.

We talk about people working or not working. If you use the coliforms as an index of contamination in Alabama and then you compare it to the fecal coliform, in some cases the bay could be kept open 8 to 9 weeks longer on the fecal coliform than it could on the coliform. When we started this project I want to make it clear now that we were not trying to put the oystermen out of business. We were trying to help them. And this has been why we have done a terrific amount of work to improve the quality of the oyster industry and it is a very simple thing. You just keep it refrigerated all the time and you have a good product. I can't say we have too good a product at some of the stores right now, but that is because they are like everything else, they grow old, getting fertile. (Laughter.) One person told me that some of the oysters are so old you get so used to eating them, that if you had a fresh oyster you would throw it away thinking it was contaminated. I wouldn't know because I wouldn't eat oysters for love nor money (laughter) but only because I don't like them.

I will make some comments here on the remark made that there are many scientists, public health people, who don't believe the fecal coliform test is adequate. I know that. There are bound to be differences of opinion here. But certain words were put in here. First of all, I don't like the statement human pathogens or human organisms. What is the difference whether they are from animals or humans? They are all possible pathogens. And secondly, I wonder, do all Salmonella infect people? I don't know how many we have, but our latest list shows approximately 1,300 species of Salmonella.

Well, to get around this, we did a little study, I am not too proud of it, but it was an honest attempt. We decided to look for pathogenic E. coli and we found strains all the way down to Station 75, and even isolated pathogenic E. coli oysters in 119, at the time the bay was closed. The only trouble with pathogenic E. coli is that I really don't know what it means.

I am sure if we take an area such as effluents from International Paper Company that the organisms in the effluents would have every right in the world to grow in the Bay waters. Certainly there must be pentoses and other nutrient material in sufficient quantities and high enough temperatures to allow growth of the coliforms. We have made no studies on this observation, however. Whether or not fecal coliforms would also grow under the same conditions I do not know since no study has been made.

As chairman of the standard methods or Recommended Procedures--you notice we don't even give the data called standard methods, it is Recommended Procedures--as chairman of this committee I am very modest. I didn't know very much compared to some of the very erudite gentlemen on the committee, but when we met two years ago, and many things can happen during that period of time, but anyway the committee recommended that Salmonella methods had not been established as a routine laboratory procedure in a public health laboratory. Now, that may have changed, I admit this very freely. I think what a lot of people forget is when you design a test you have to keep in mind certain things, the speed, the sensitivity, the reproducibility and the cost. We could start looking for Coxsackie virus in which we could probably come up with something in about three or four months. Presently I am not against looking for pathogens in water as an index of pollution. But I do think when you put it on a mass scale you run into a lot of obstacles you don't find when you do just actual research.

Dr. T. S. Hosty

Alabama can only live with the fecal coliform test. Tomorrow you may have a much better test. There are two or three other methods that have been described, for instance use the dihydrostreptomycin in getting out pathogenic E. coli without having to pick 15 to 100 colonies. Well, we are trying it but I can't tell you right now how effective it will be.

The point I am making here is no test can be made static and I think we have just been spellbound by coliforms versus fecal coliforms. Why in heaven's name do we accept the fecal coliforms in oysters but not in waters? I don't understand this at all. I do feel that we can say that this is an imposition on the State of Alabama if you are going to impose a coliform test for pollution, which in my opinion means very little.

As a matter of fact, the Pure Food and Drug representatives and I have had a very interesting little argument out at Gig Harbor several years ago in which they said that the fecal coliform test should be performed at 45.5 C because all they were interested in recovering was E. coli. Now all of a sudden E. coli, which is a fecal coliform, becomes a dirty word.

Dr. T. S. Hosty

Two years ago at the end of the shellfish sanitation meeting Mr. William Beck was authorized out at Gig Harbor to collect data around the United States from which he could try to analyze what the magic number would be for the fecal coliform test. We submitted our data, other States submitted theirs, and Mr. Beck came up with the magic number 23.

So again, I think a reasonable solution would be the fecal coliform test or it may be that we shall have to allow for regional differences. I could propose and will propose and have proposed that as soon as the recommended procedures come out that certain laboratories, including the Federal ones, run the waters of their own area to see how it compares, not shipping water, because you get into a little trouble there, but just see how each test performs in each area.

The little bit of work we have done on the enterococci makes me wish I had a statistician. Anyway, in about 175 to 185 determinations we ran both coliforms, fecal coliforms and the membrane filter enterococci, and I really don't know yet what has happened.

If you took the fecal coliform as showing pollution and then looked at your coliforms, you would find out that about 25 of the coliforms were showing additional pollution whereas the fecal coliforms weren't. If you looked at the enterococci you would see 28 were showing pollution where the fecal coliforms were not. Now, which came first, the chicken or the egg? I don't know and the analysis is not complete. But if I am right in this, then the enterococci is no better indicator for pollution than the coliform. So that it is sort of a mess, and I think the only bed we can lie in is the fecal coliform bed.

In the elaborate study by the Southeast Water Laboratory it was concluded that even if you cleared up the whole Mobile Bay pollution problem, there would still be enough coliforms coming down from rivers to cause closing of the oyster beds on the basis of coliform MPN's. Of all procedures from a public health viewpoint, the sanitary survey is of prime importance. I do not believe any laboratory test currently in use should be substituted for it. I was chairman of a

Dr. T. S. Hosty

meeting two weeks ago at the medical school in Alabama on pitfalls of laboratory examination and they selected me because they heard I was very good at pitfalls in examinations. (Laughter.) In most of the studies I have read about, the use of Salmonella as an indicator of pollution has not been adequate since it has not been done in a quantitative manner. This surprises me since our whole concept of the study of pollution has been based on organisms primarily but also on their number. This was brought out quite vividly some years ago on the study of salmonella from powdered milk in which quantitation became a very important factor in the assessment of problems with that industry. If pathogens do become indicators of pollution, then methods will have to be devised which will also indicate their numbers unless one believes one Salmonella per unit of water; for example, could indicate potential hazard.

And finally, if I am going to look into the future, I still believe in some type of depuration. I think this may be the answer to all of the woes and troubles which we have. I hear that there are several commercial plants being started.

Bacterial studies on the effect of depuration or transporting oysters to clean areas have been made by many different laboratories and demonstrate the oyster does depurate itself in a very short time of an excessive number of organisms. On the other hand, the presence of viruses is another story. Continuing studies of the depuration of viruses was initiated some four or five years ago by some of the Public Health Service laboratories, one of which was Dauphin Island. Using polio viruses they were able to show that the oyster cleared itself of the contaminating virus in a relatively short time. Since I did not refer to their work before coming down here, I hope that I have quoted them correctly.

Thank you.

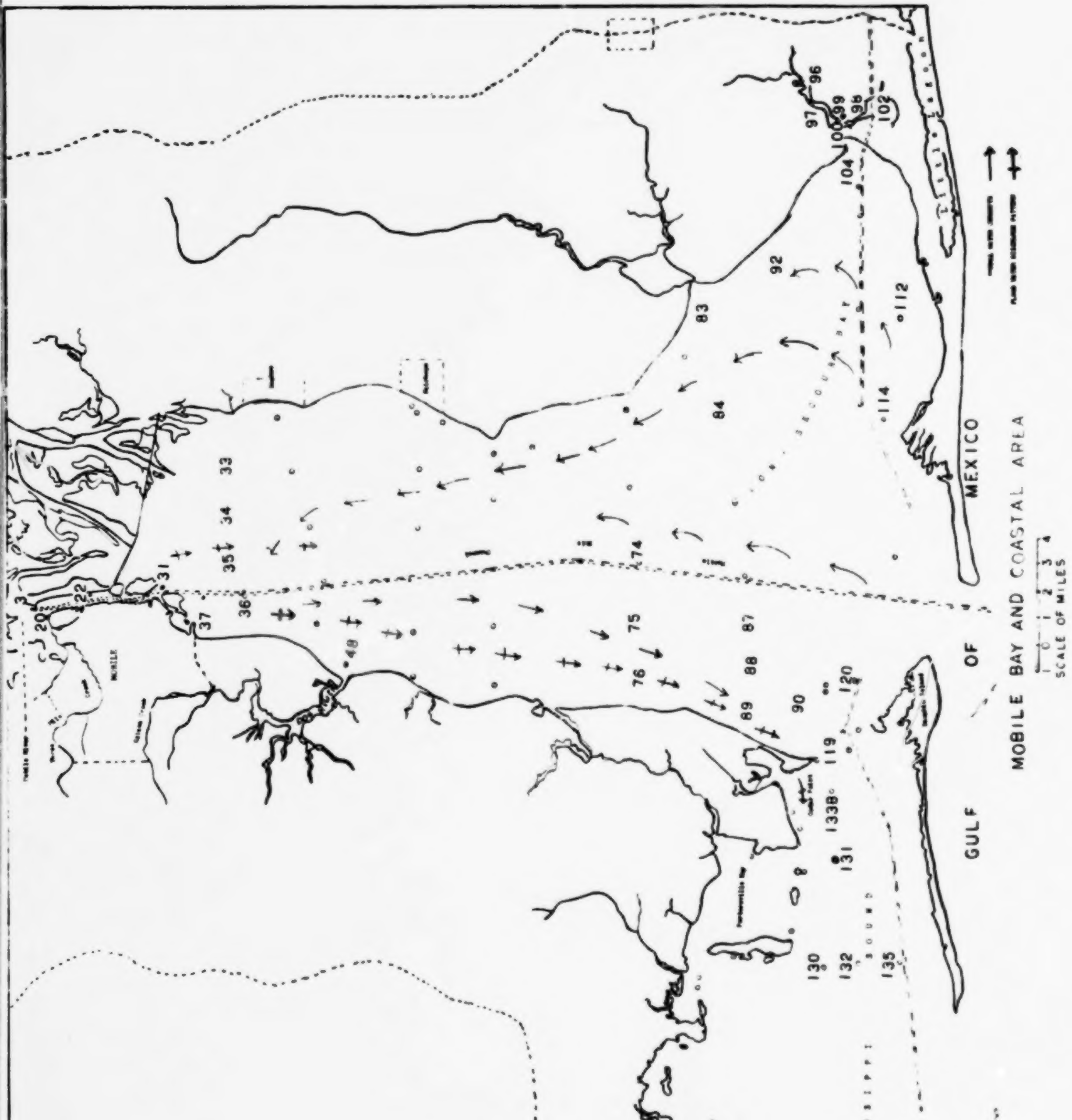
MR. STEIN: Thank you.

Do you want these charts in the record, Dr. Hosty?

DR. HOSTY: Yes.

MR. STEIN: They will be included.

(Which said charts are as follows:)



MOBILE BAY AND COASTAL AREA

GULF
OF
MEXICO
SOUND
0 1 2 3 4
SCALE OF MILES
3
20
22
31
33
34
35
36
37
48
74
75
76
83
84
87
88
89
90
92
96
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99
100
102
104
112
114
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131
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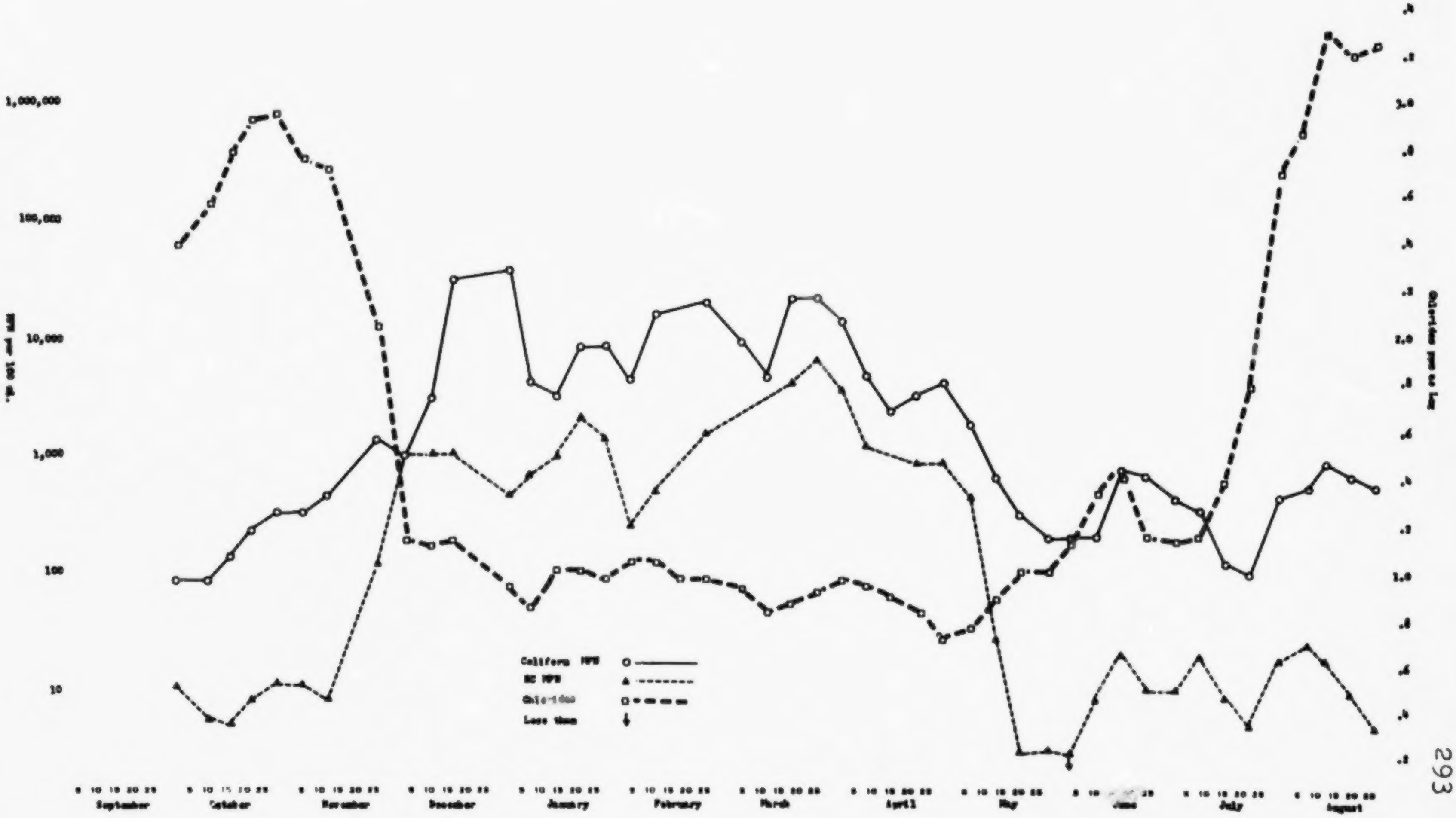
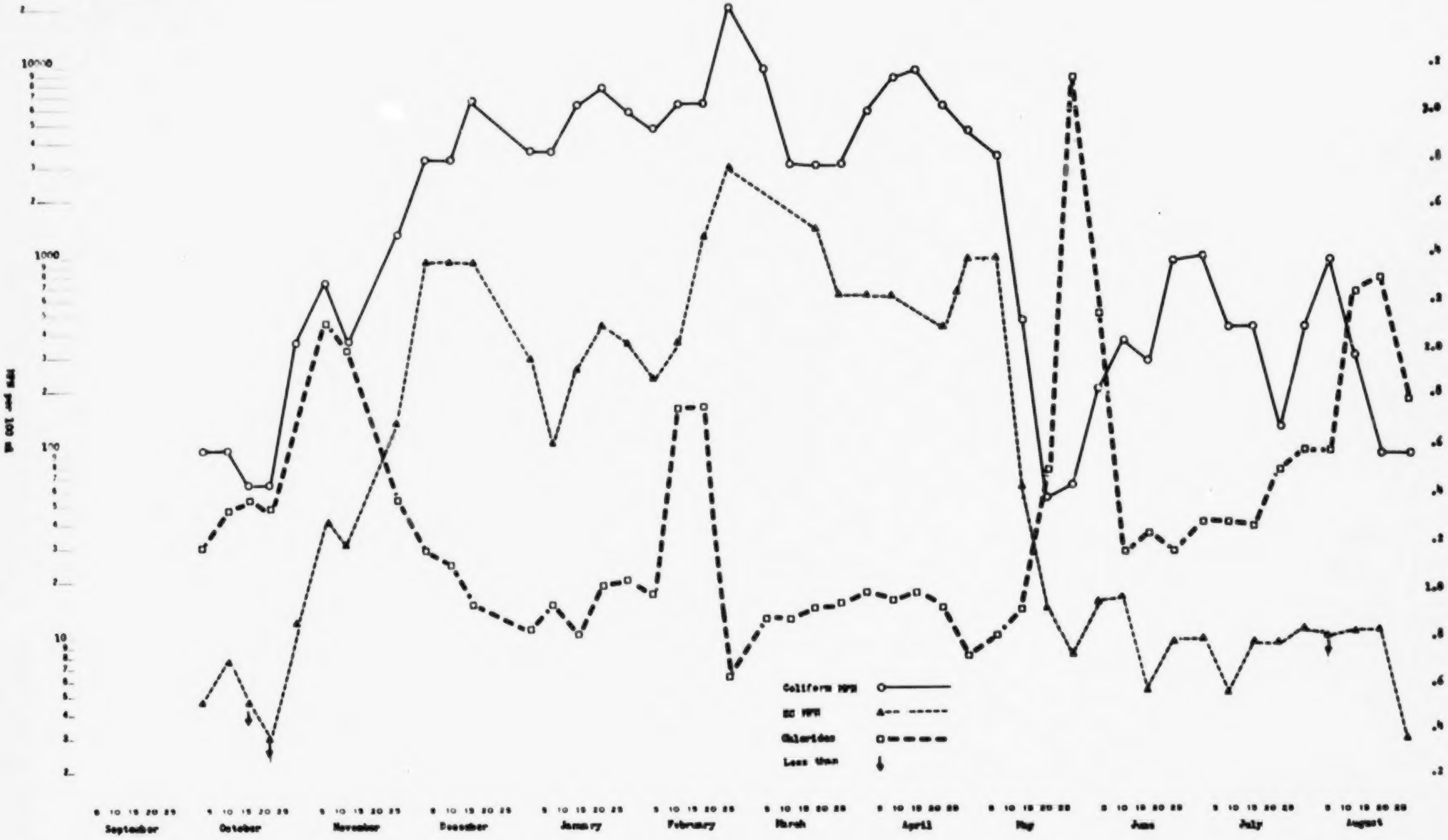
133B
135

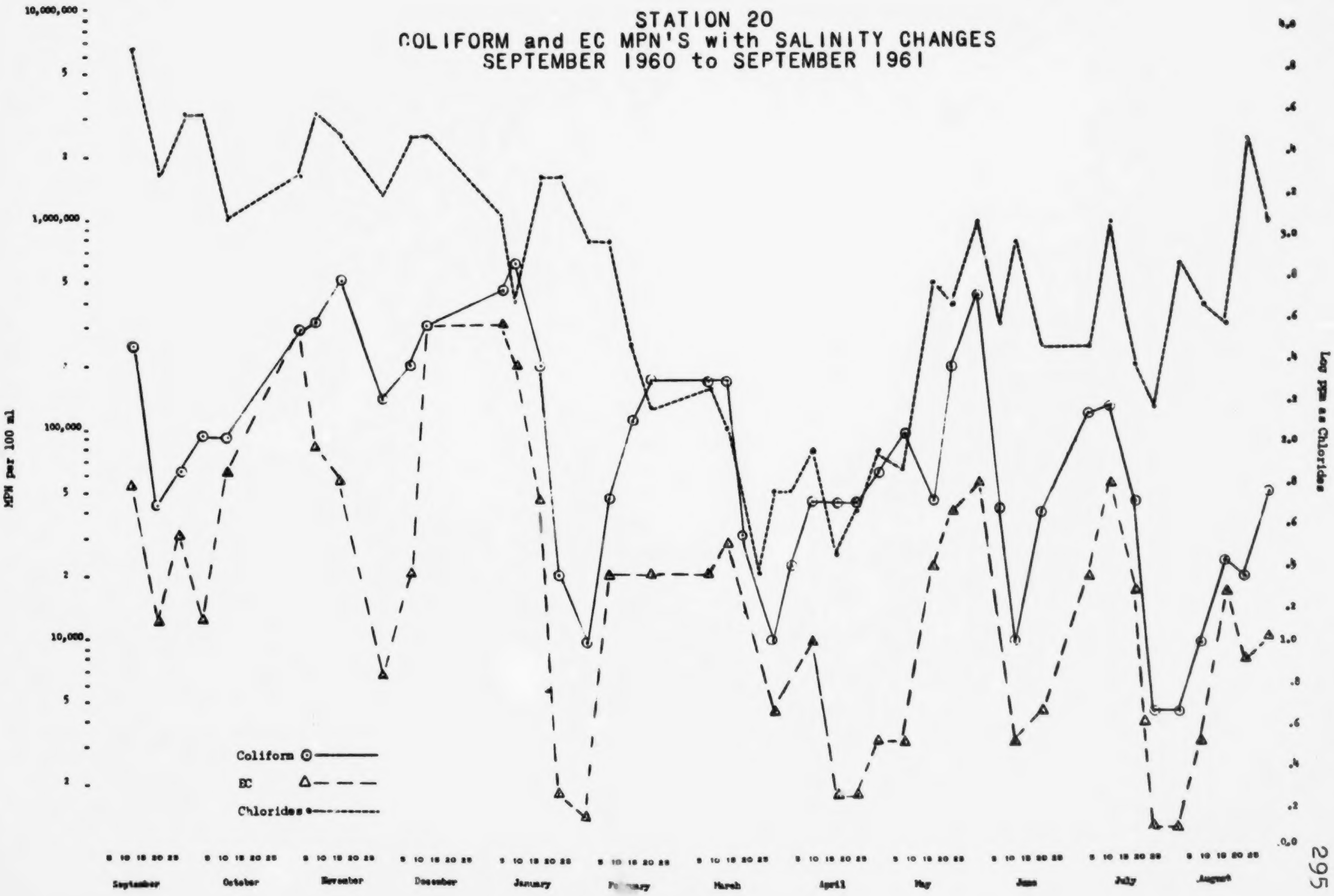
STATION 2
COLIFORM and EC MPN'S with SALINITY CHANGES
OCTOBER 1961 to SEPTEMBER 1962



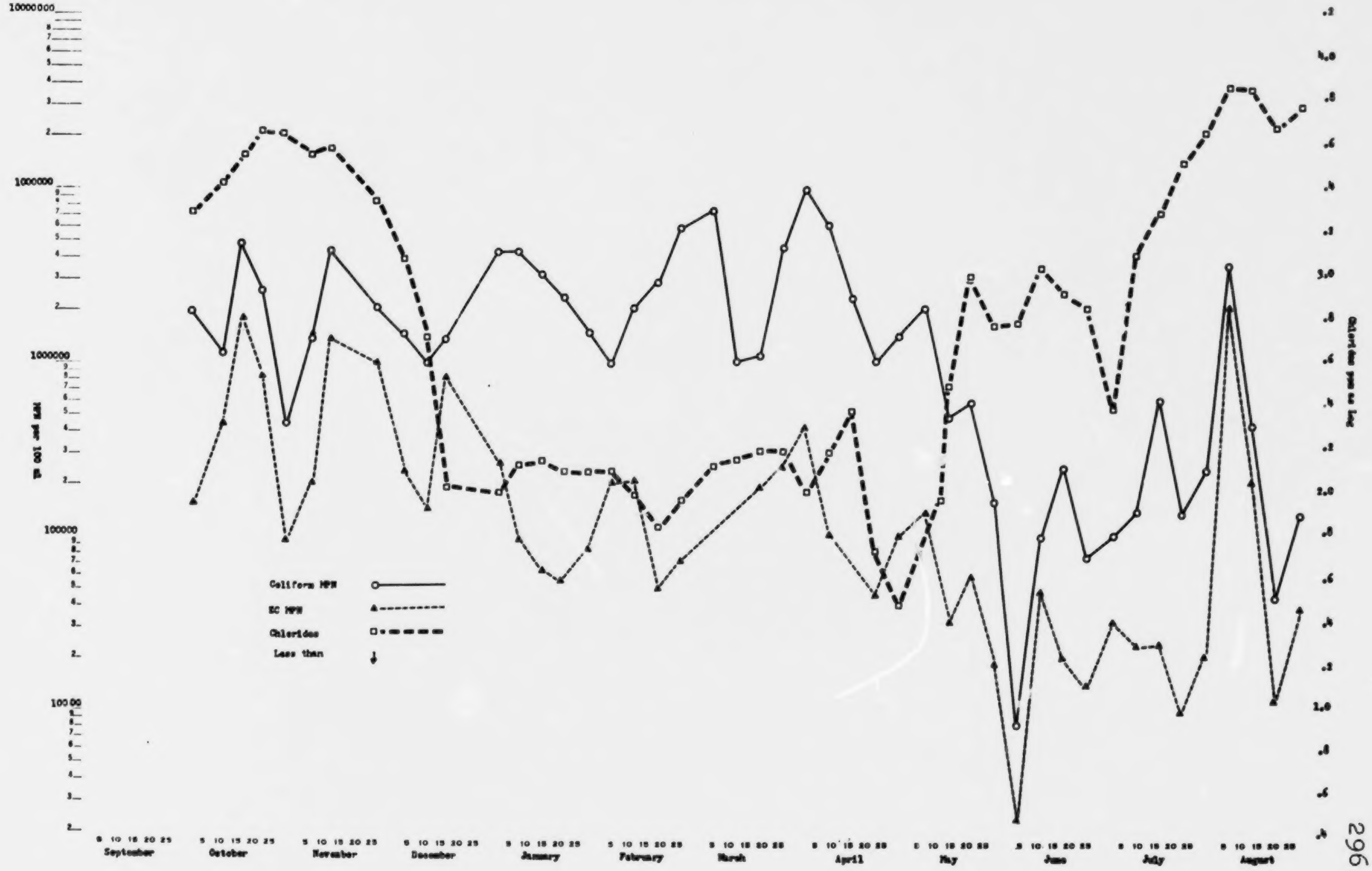
STATION 4
COLIFORM and EC MPN'S with SALINITY CHANGES
OCTOBER 1961 to SEPTEMBER 1962



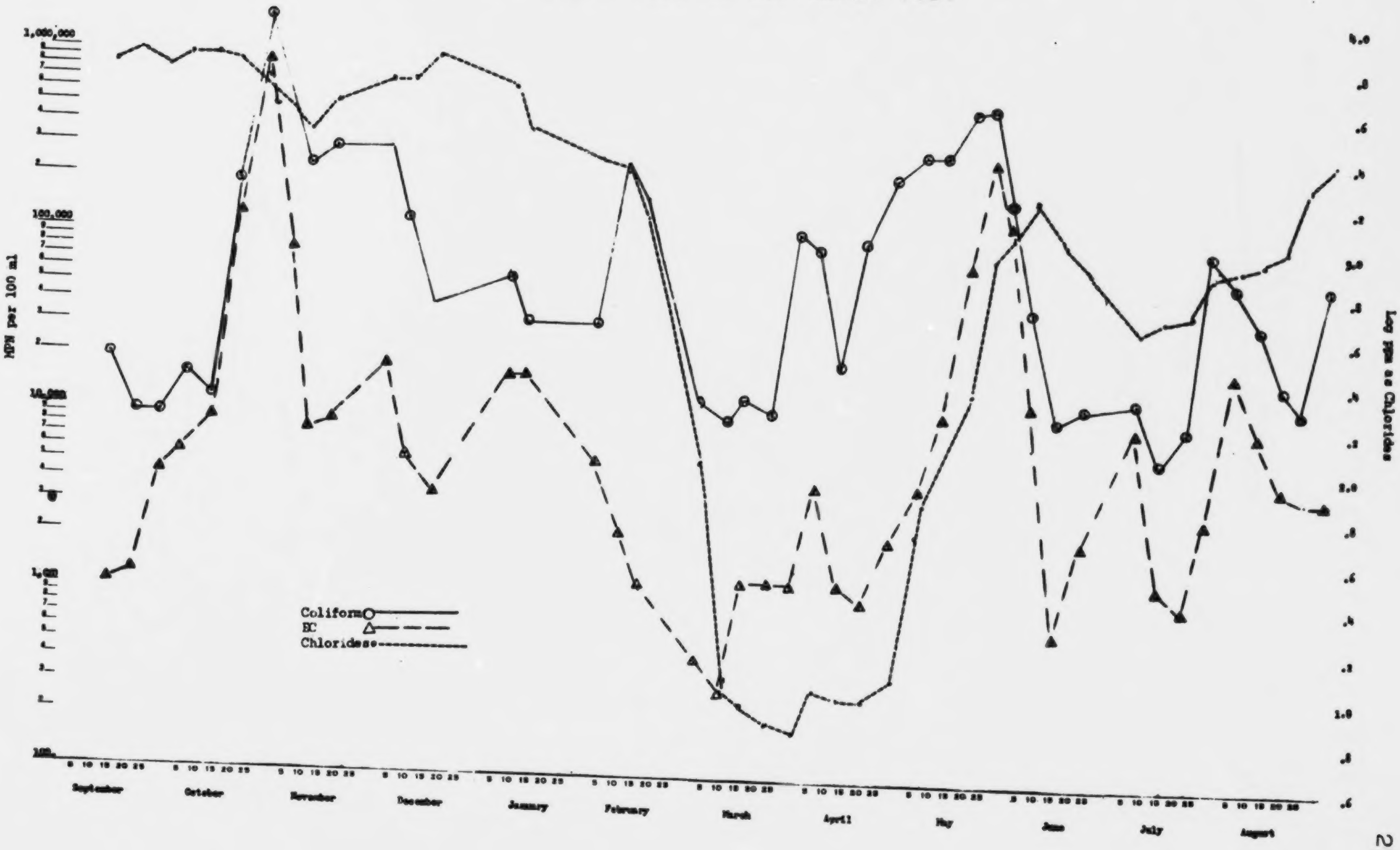
STATION 20
COLIFORM and EC MPN'S with SALINITY CHANGES
SEPTEMBER 1960 to SEPTEMBER 1961



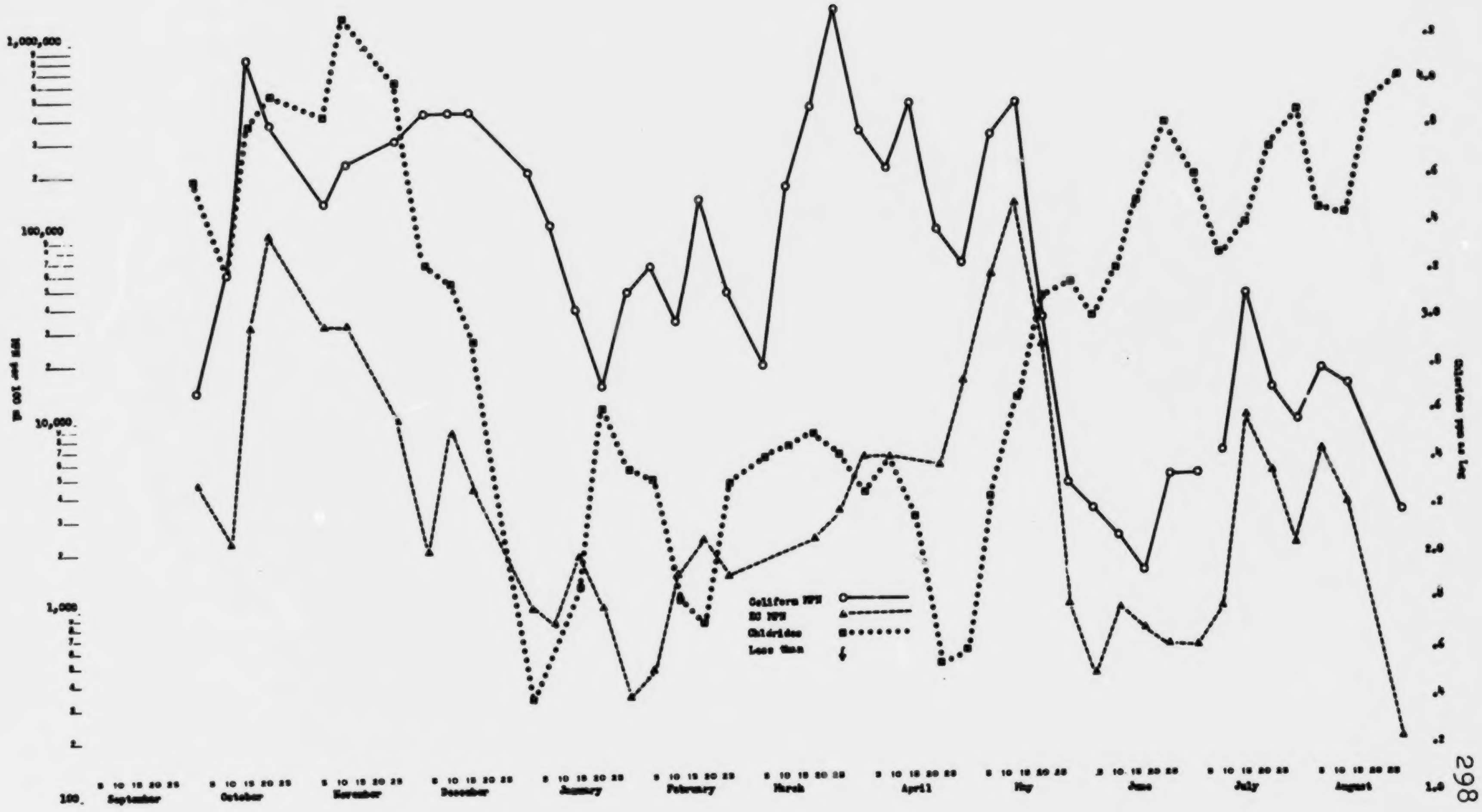
STATION 20
COLIFORM and EC MPN'S with SALINITY CHANGES
OCTOBER 1961 to SEPTEMBER 1962



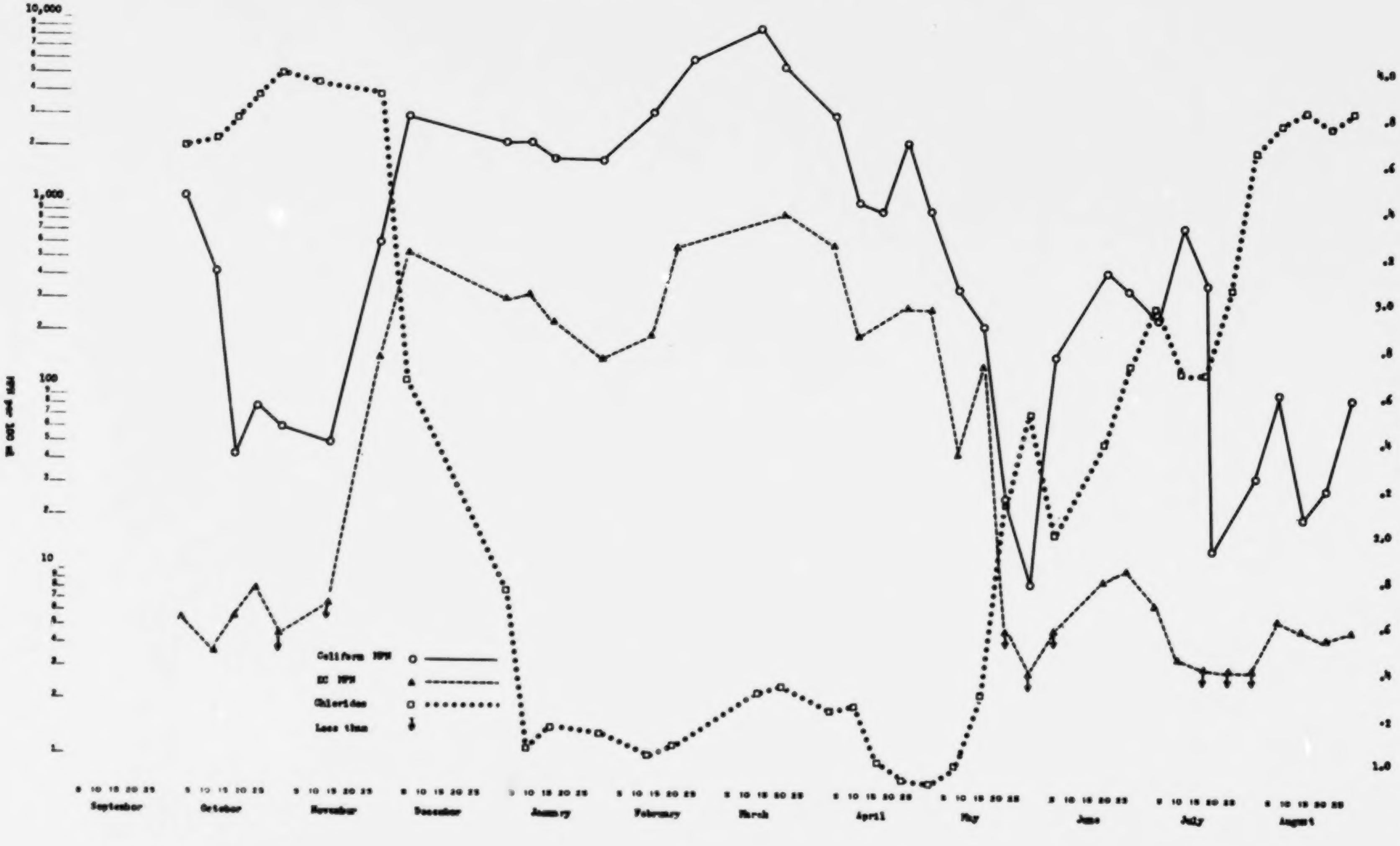
STATION 31
COLIFORM and EC MPN'S with SALINITY CHANGES
SEPTEMBER 1960 to SEPTEMBER 1961



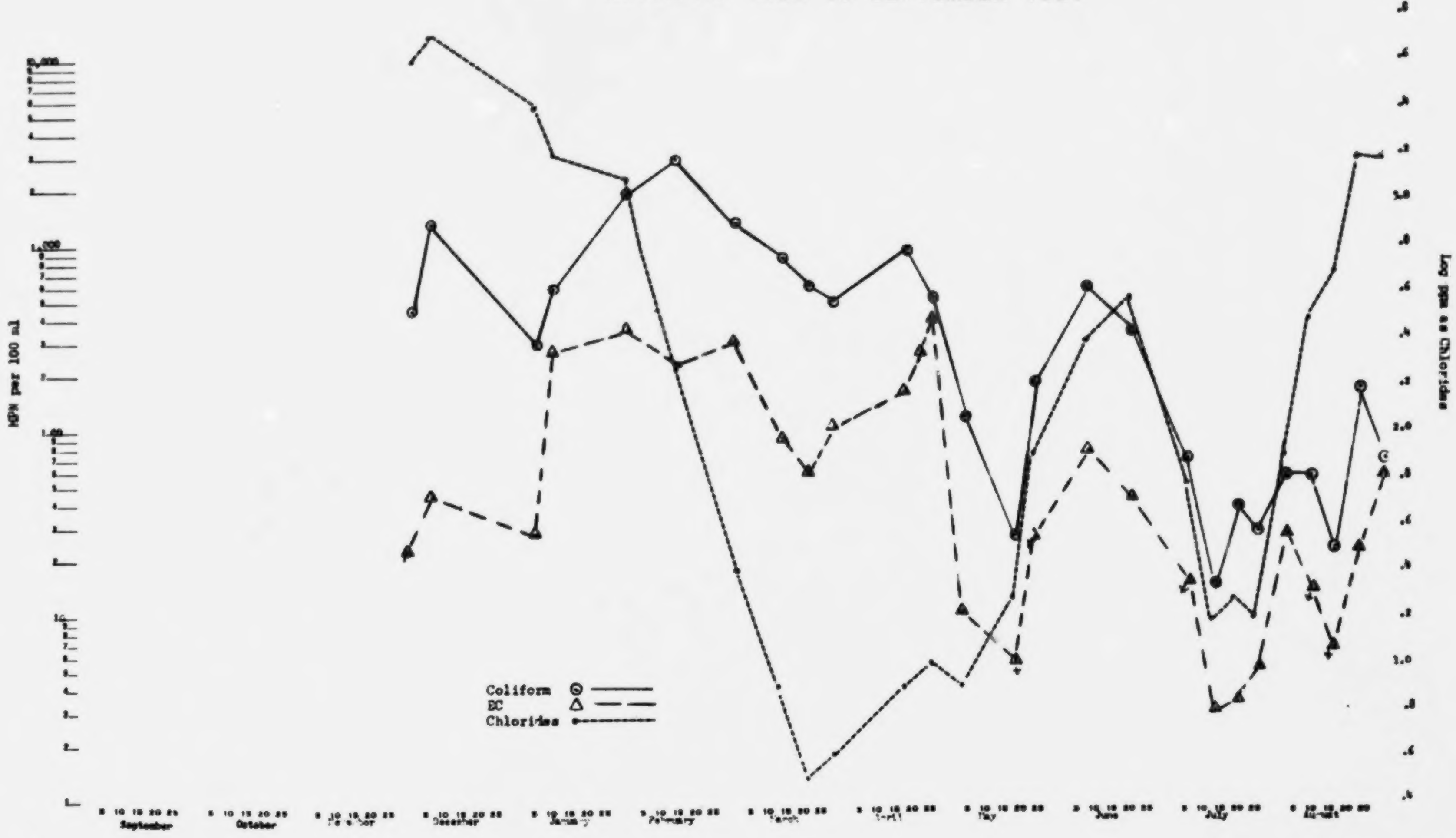
STATION 31
COLIFORM and EC MPN'S with SALINITY CHANGES
SEPTEMBER 1961 to SEPTEMBER 1962



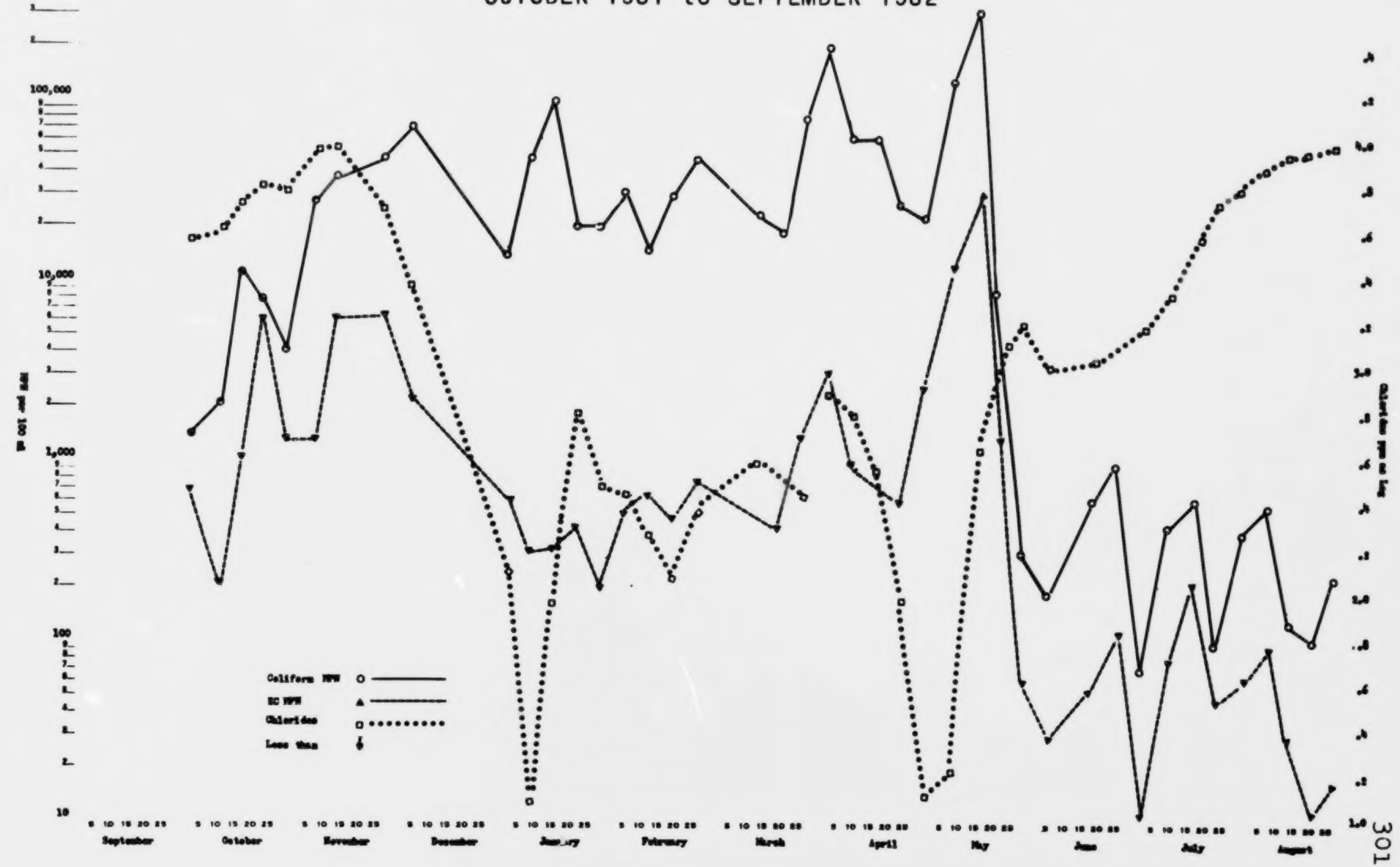
STATION 33
COLIFORM and EC MPN'S with SALINITY CHANGES
OCTOBER 1961 to SEPTEMBER 1962



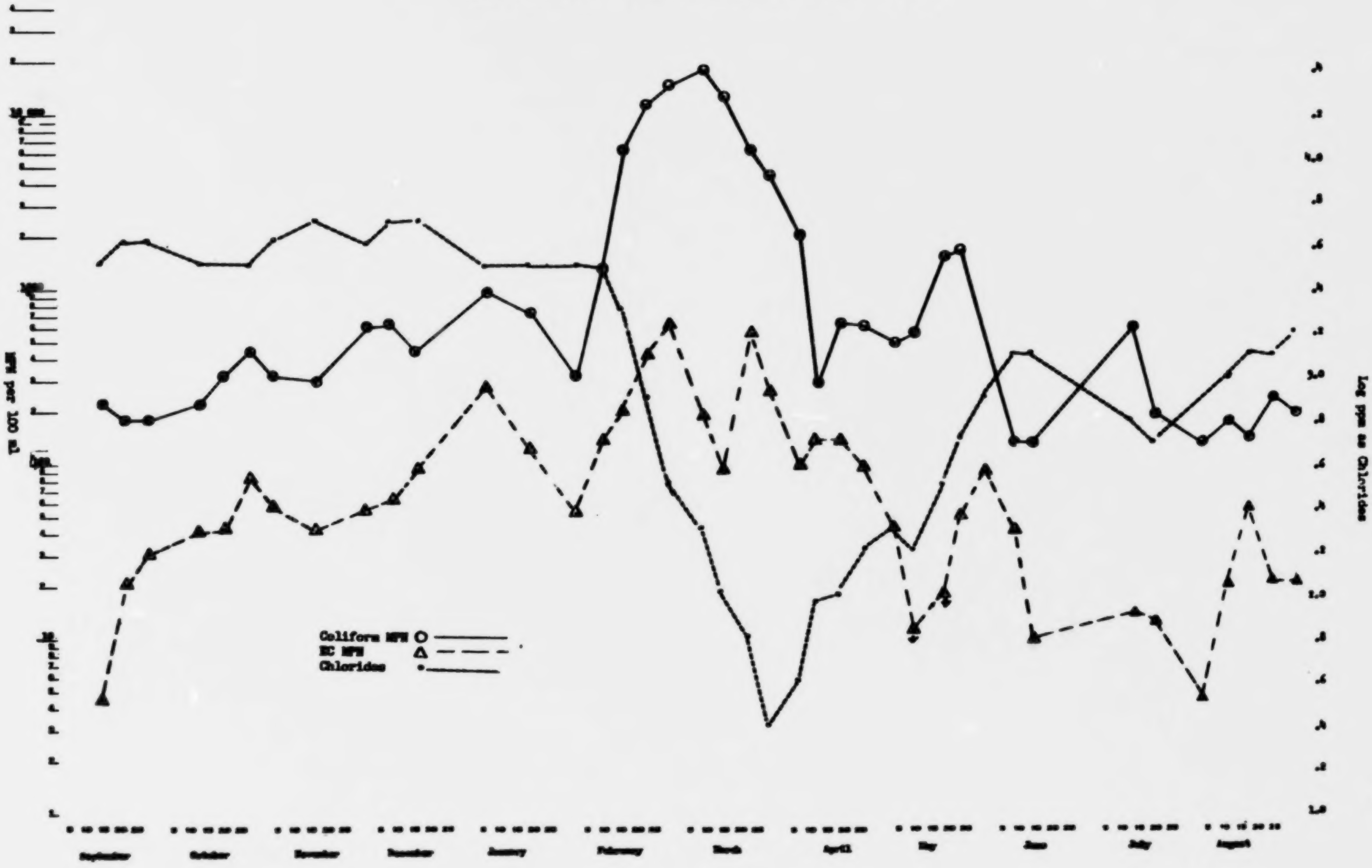
STATION 34
COLIFORM and EC MPN'S with SALINITY CHANGES
NOVEMBER 1960 to SEPTEMBER 1961



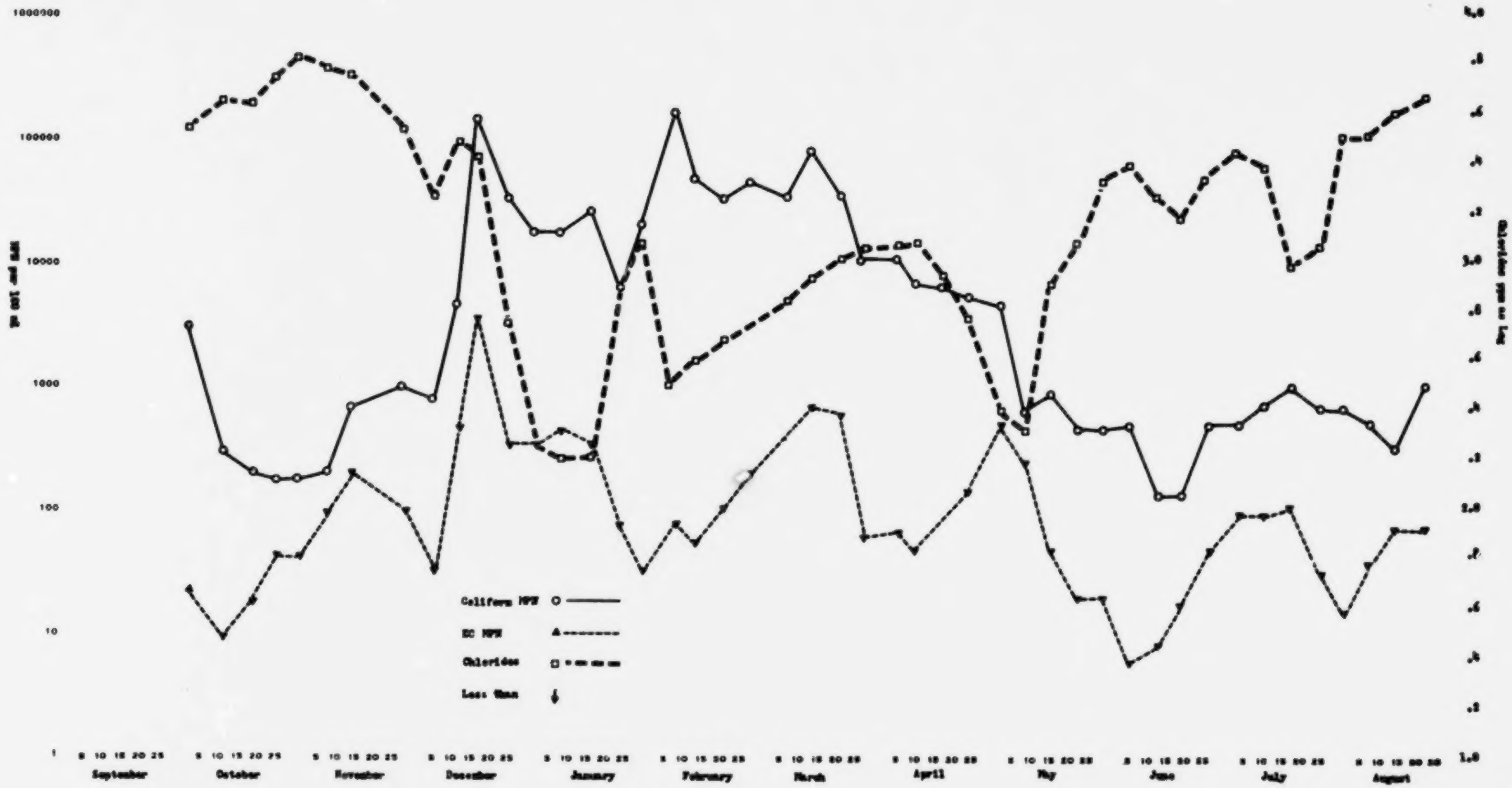
STATION 36
COLIFORM and EC MPN'S with SALINITY CHANGES
OCTOBER 1961 to SEPTEMBER 1962



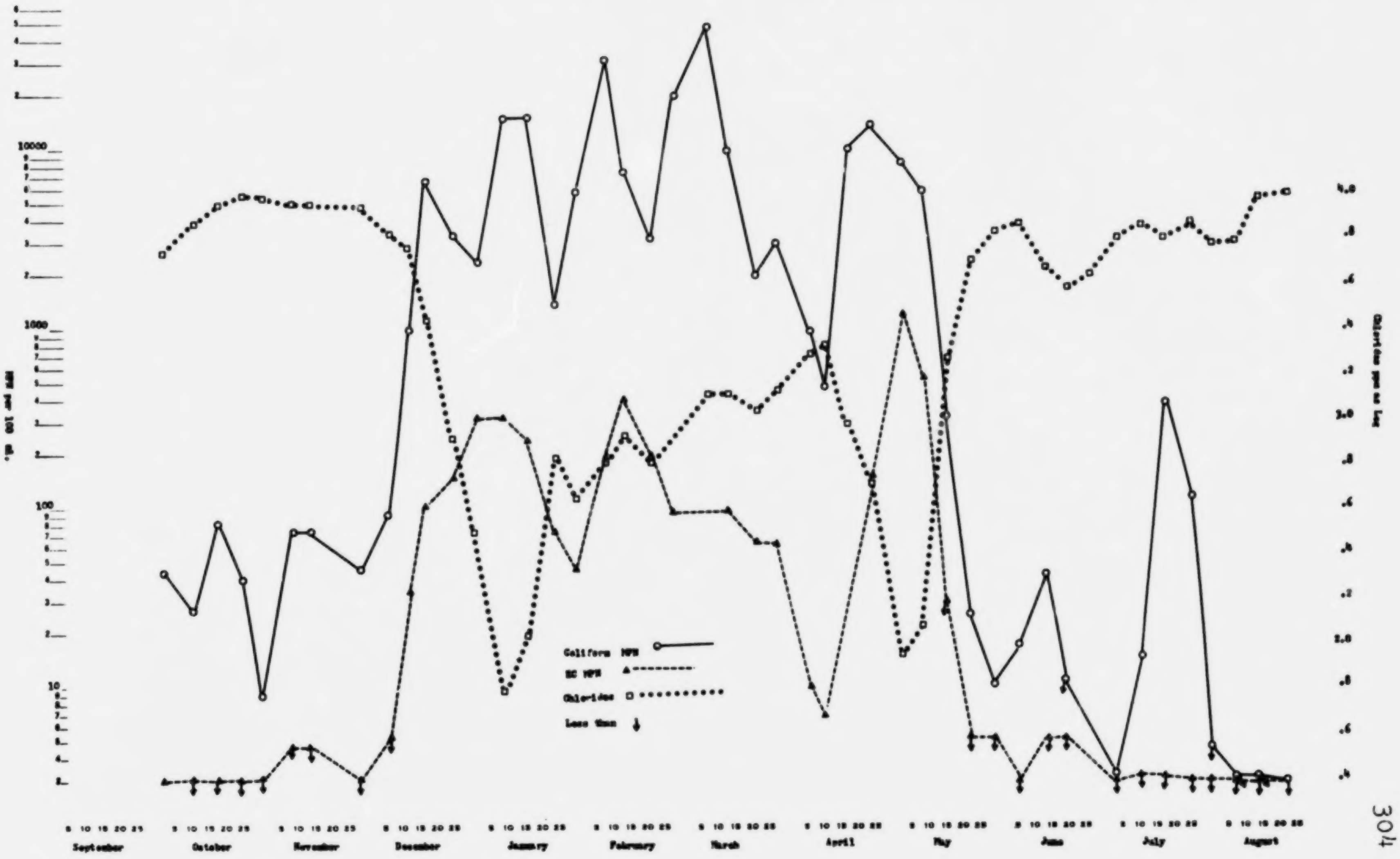
STATION 48
COLIFORM and EC MPN'S with SALINITY CHANGES
SEPTEMBER 1960 to SEPTEMBER 1961



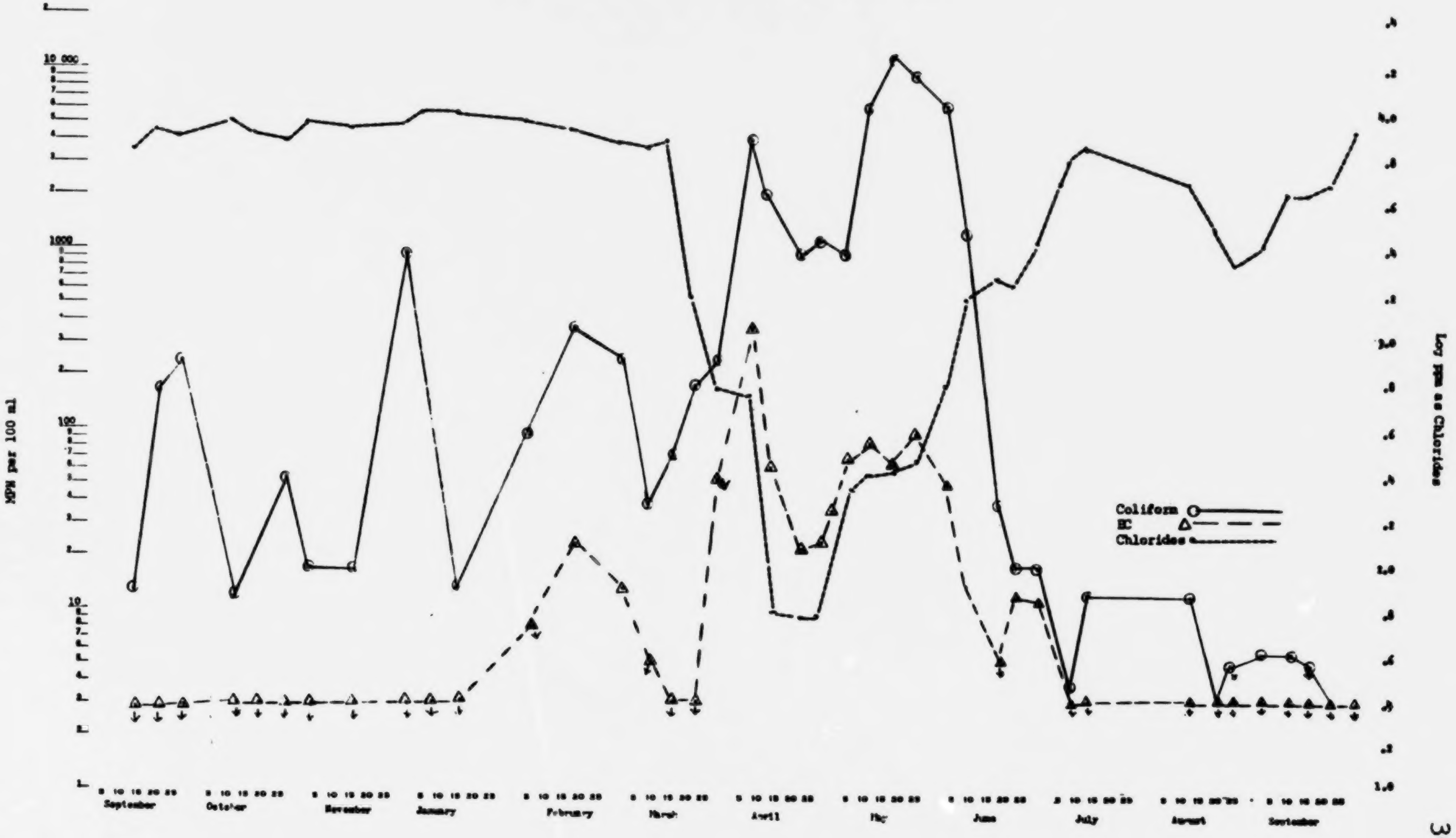
STATION 48
COLIFORM and EC MPN'S with SALINITY CHANGES
SEPTEMBER 1961 to SEPTEMBER 1962



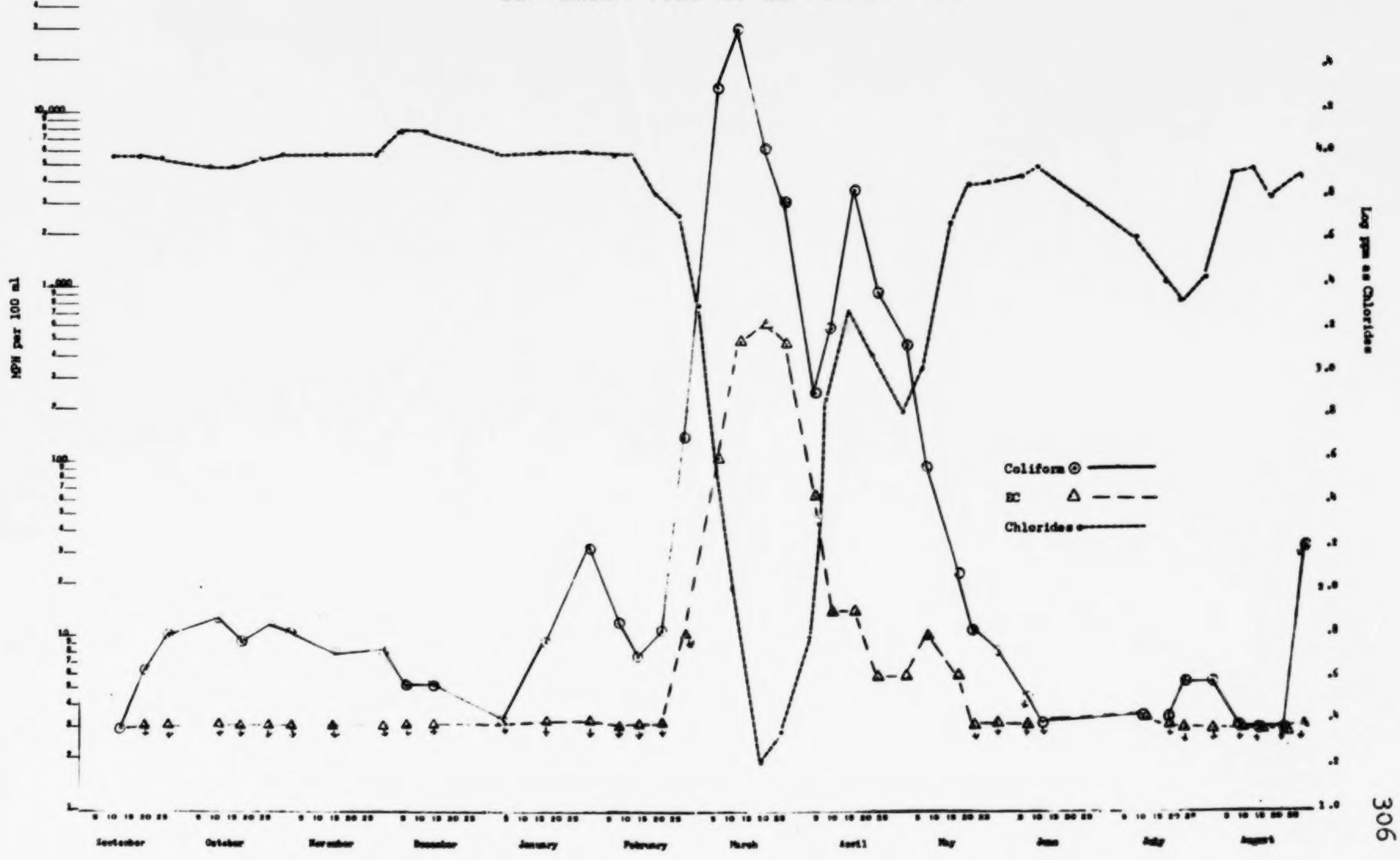
STATION 75
COLIFORM and EC MPN'S with SALINITY CHANGES
OCTOBER 1961 to SEPTEMBER 1962



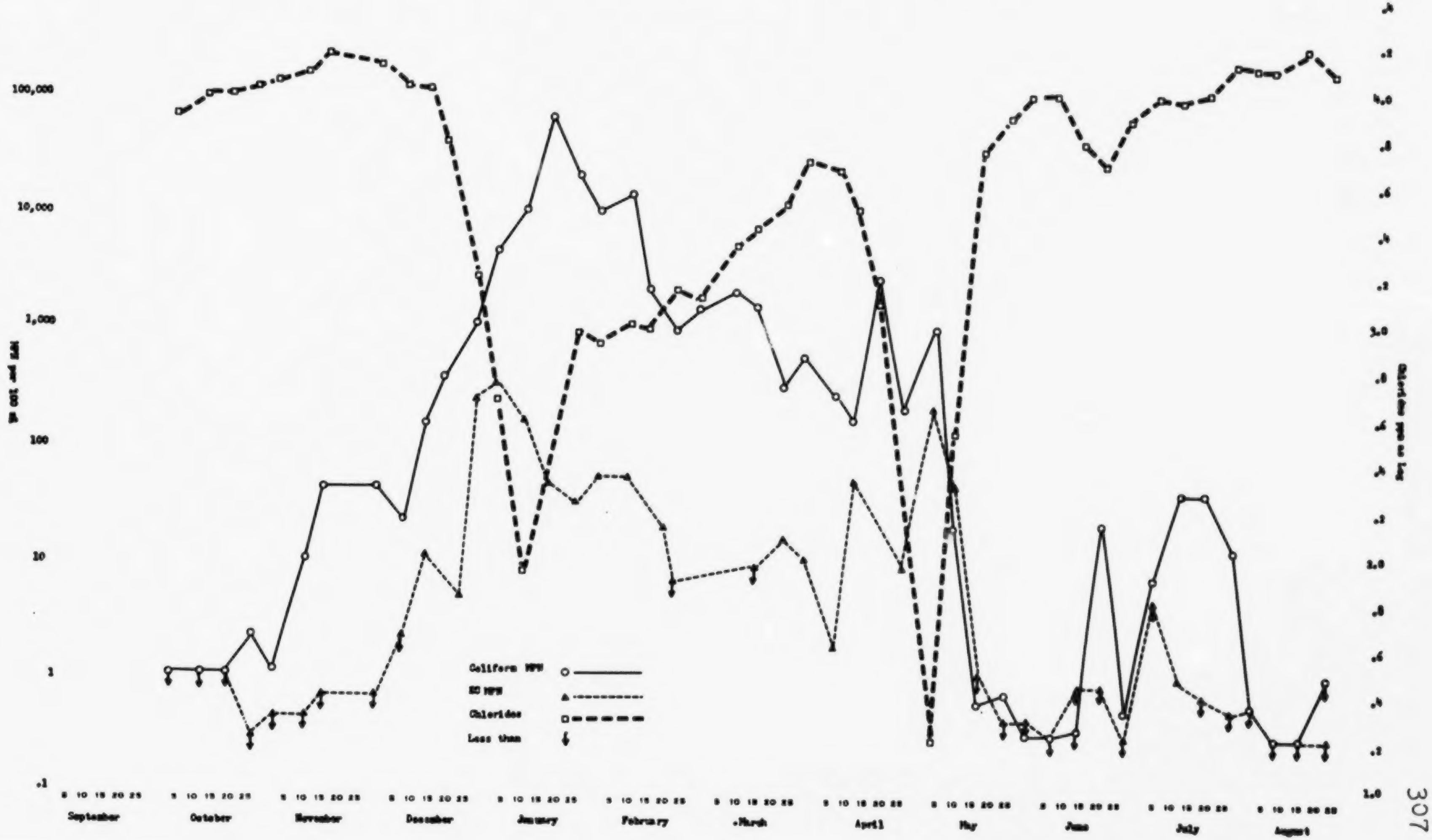
STATION 87
COLIFORM and EC MPN'S with SALINITY CHANGES
SEPTEMBER 1960 to SEPTEMBER 1961



STATION 119
COLIFORM and EC MPN'S with SALINITY CHANGES
SEPTEMBER 1960 to SEPTEMBER 1961



STATION 119
COLIFORM and EC MPN'S with SALINITY CHANGES
OCTOBER 1961 to SEPTEMBER 1962



PERCENTAGE of IRREGULAR VI and OTHER EC POSITIVES COMPARED to TYPES I and II E. COLI by PERIODS

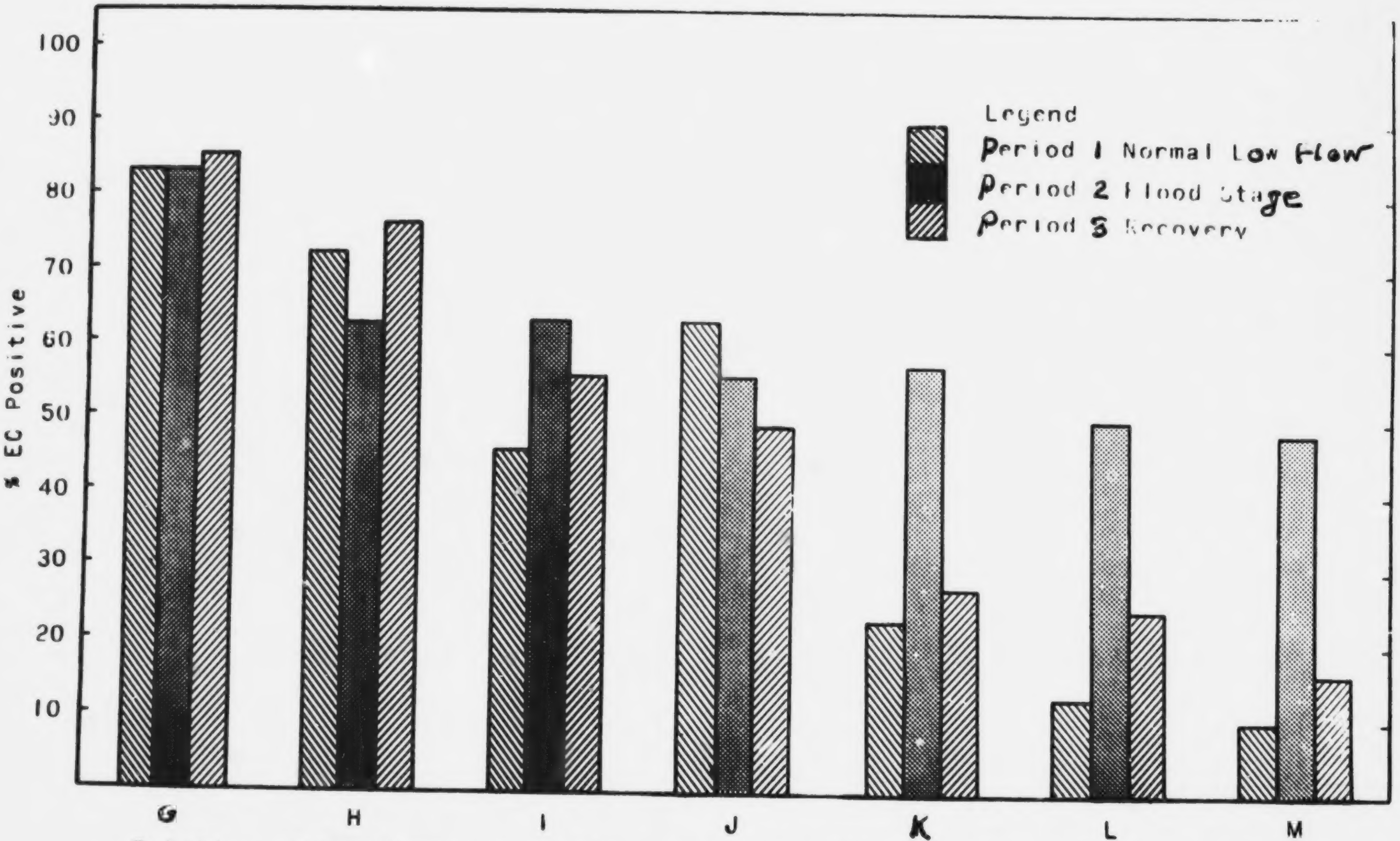
Period	Stations by Group						
	G	H	I	J	K	L	M
1	4.4	13.16	3.44	14.28	31.34	22.22	11.76
2	2.8	9.2	14.46	7.46	10.66	5.17	13.28
3	8.5	20.43	41.08	34.14	70.73	40.62	41.66

Coliform and EC Percentile Probabilities by Station and Period

			50%		90%	
Group	Station	Period	Coliform	EC	Coliform	EC
G	20	1	2 300 000	750 000	11 000 000	4 300 000
		2	930 000	93 000	2 300 000	430 000
		3	750 000	43 000	2 300 000	750 000
H	22, 31 36, 37	1	93 000	4300	930 000	23 000
		2	15 000	930	230 000	4300
		3	15 000	3900	230 000	75 000
I	33, 34 35	1	230	9.1	930	230
		2	930	150.0	4300	750
		3	93	75.0	930	93
J	48	1	390	43.0	930	150
		2	230	23.0	390	120
		3	4300	230.0	15 000	430
K	74,75 76	1	230	3.6	930	23
		2	2300	150.0	43 000	430
		3	9.1	3.0	230	21
L	87,88 89	1	23	3.0	930	9.1
		2	2300	93.0	9300	430
		3	7.3	3.0	430	9.1
M	90,133B 119,120	1	9.1	3.0	93	3.6
		2	3900	93.0	15 000	430
		3	3.6	3.0	230	7.3

EC CONFIRMED POSITIVES by TYPE and INCUBATION TIME

	24 Hour Incubation				48 Hour Incubation			
Confirmed EC +	E.coli I	E.coli I & II	Irr.VI	Other	E.coli I	E.coli I & II	Irr.VI	Other
8406	7128	7435	666	106	14	17	165	11
	84.8%	88.4%	7.9%	1.3%	0.16%	0.20%	1.9%	0.13%



Relation of Confirmed EC Positive Tubes to Coliform Positive Tubes by Period

MR. STEIN: Are there any comments or questions?

MR. WHITE: I would just like to ask Dr. Hosty one question. Would it be a problem for you as far as your field sampling goes to go to the fecal coliform test?

DR. HOSTY: To which?

MR. WHITE: To the fecal coliform test? Or possibly are you doing this now in conjunction with the--

DR. HOSTY: We are doing the fecal coliform test.

MR. WHITE: You are doing the fecal--

DR. HOSTY: Of course by the very nature you are doing coliform when you are doing fecal coliform. Yes, we are doing it and the thing was that in the manual or the work for 1930 which I gave you there, you will notice in there that we were one of the first ones to--not advocate,but it shows in our data that you need to run the fecal coliform for 48 hours, that if you elevate the temperature you start losing some of the exhibits, I will call them, not E. colis.

MR. STEIN: Well, I thank you. You know, I think you have exemplified, I think, the other side of the field. I am glad you came after the previous witness.

First I would like to say, you know, you think you have trouble with not eating those oysters. Imagine being in the water business and I think this is a most dismal failure as a beverage. (Laughter.)

But I think the essence of what you have said is the notion in the field that we have to get into production. Now, what Dr. Hosty put out is a test that is meaningful, that is reasonable, that he can do and do within his budget.

One of the problems we run into is that for anything we come up with, somebody comes up with the answer that we need some further research.

There isn't one company or group here that doesn't face this, or anyone running a big organization in the government that doesn't face it. But sometimes we have to tell these guys to stop sharpening criteria and go into production, because they always want another six months. As was pointed out, when tests we run are not quantitative, they need some more research and more research.

Now, I throw this out. If what Dr. Hosty is saying is true, and this makes a lot of sense to me, if we are talking in terms of fecal coliform tests; if he can guarantee that shellfish taken in the area where he applies this test--and he can give his imprimatur of approval--are going to be safe oysters; if this works in Alabama and can be demonstrated in Alabama--then I submit, while this may not be the same kind of test that would be applicable in other areas of the country, I see no reason for it not to be accepted in other areas of the country and for the shellfish to go in interstate commerce. If we are not going to get sick from eating them here and they are going to be perfectly palatable and safe, they are going to be palatable and safe if kept on ice and shipped.

Then the second implication is, if we are going to use the fecal coliform test, then we follow it through to its logical conclusion and we follow it to its conclusion on a waste source wherever it comes from. If this is true and then we take the other group--and I am against this human health, and so forth and so on, too--as long as there is an organism in a waste that is going to be harmful, we don't care what the source is. If the fecal coliform is an indicator that that waste may be there, then we have to do something to that before we are going to let that waste go out. And it seems to me for a sensible regulatory program this just might be an approach.

Now, I think we are, as we have been, very close--at least I feel very close to the people in Alabama. I said this before. Working in the shellfish area, I have found that the thinking on shellfish protection among the people in Alabama, Mobile Bay particularly, is about the most sophisticated in the country. Dr. Hosty, I don't believe you or anyone else in this area has to take a back seat to anyone on the standard or uniform procedures setting panel. It wasn't an accident that someone with experience down in this area got to be named chairman of that panel.

Thank you very much.

DR. HOSTY: Thank you.

MR. STEIN: We will take a short recess.

(RECESS)

MR. STEIN: Let's reconvene.

Dr. Myers.

DR. MYERS: Mr. Johnie Crance, Director of the Alabama Marine Resources Laboratory, Seafoods Division, Alabama Department of Conservation.

JOHNIE H. CRANCE, DIRECTOR
ALABAMA MARINE RESOURCES LABORATORY
SEAFOODS DIVISION, ALABAMA DEPARTMENT OF CONSERVATION, DAUPHIN ISLAND, ALABAMA

MR. CRANCE: Mr. Chairman, conferees. I am Johnie Crance, Director of Alabama Marine Resources Laboratory, Alabama Department of Conservation, Seafoods Division.

I would like to thank the Federal Water Pollution Control Administration and others who played a part in bringing about this conference today.

I would also like to commend the Federal Water Pollution Control Administration and its staff for the study and the very timely report presented here today. I feel that the FWPCA report on Mobile Bay and this conference will focus attention on some of our pollution problems and the urgent need for a solution to these problems.

The Alabama Department of Conservation Seafoods Division responsibilities include the management, development, and conservation of the oyster, shrimp and other marine fisheries resources within the 400,000 acres of estuarine waters, 130 square miles of salt water within our territorial limits, and the enforcement of conservation laws within these waters. The Seafood Division has a staff of five biologists and fourteen enforcement officers.

Our research activities are fairly young, about three years old. During this period our primary research efforts have been spent on studying ways to better manage and enhance our oyster resources. We have not obtained financial support to perform all the needed research, but we have made a good start. We are in the process of completing the comprehensive survey of our oyster beds and the potential oyster producing bottoms of the State. This report, to be published this year, will include maps of Alabama's oyster reefs and bottoms, a qualitative and quantitative examination of each reef, and information on diseases of oysters and other information that would assist you in managing our valuable oyster resource.

The Seafoods Division does not employ microbiologists or personnel who monitor our oyster producing areas for bacterial pollution. This activity and other activities for carrying out sanitary controls over our oyster growing areas, harvesting and handling in the interest of public health are performed by the Alabama Department of Public Health. When sanitary conditions within an oyster growing area are found to be below the minimum requirement by the Department of Public Health, the State Health Officer issues a closure order. Closure of the area is enforced by the Conservation Department Seafoods Division.

It would be repetitious to repeat dates of closure of oyster reefs in Mobile Bay, catch statistics and other data documented in the FWPCA report. This report has named sources of pollution, discussed water quality, and estimated the economic loss that occurred as a result of pollution and closure of oyster reefs in Mobile Bay. This is a very good report, I would like to say again. I feel, however, that the estimated economic loss to this region during 1969 may be much higher than the estimate of $227,000 that was reported by the FWPCA for previous years.

Based on statistics compiled by the U.S. Bureau of Commercial Fisheries, the average daily landings of oyster meats during a nine-year period from 1960 through 1968 was 2,289 pounds per day in Mobile County and 516 pounds per day in Baldwin County. These averages include days when the reefs were closed and includes off-season months. During 1969 the amount of oysters landed in Alabama waters were less than one-half the annual average for the previous nine-year period. 1969 was a year when reefs in Mobile County were closed 117 days and reefs in Baldwin County were closed 21 days. We can reasonably assume that during 1969 the average daily landings would have been equal to or greater than the previous nine-year average daily landings if the reefs had not been closed.

If we make this assumption and multiply the

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number of days the reefs were closed by the average daily landings for the previous nine-year period, we will arrive at an estimate of the number of pounds of oyster meats that would have been harvested during the 1969 closure. This figure is equal to 267,813 pounds for Mobile County and 10,836 pounds for Baldwin County or a total of 278,649 pounds of oyster meats that would have been harvested during the closure in 1969. The dockside value of oyster meats during January of 1969 was reported at $0.52 per pound. Then using the value of 52 cents, the 278,649 pounds of oysters that would have been harvested during the closure in 1969 would be valued at $144,897 dockside.

Our biologists, using scuba gear, have sampled Hollingers Island oyster reef. This reef is 13.2 acres in area and located in a permanently closed area of Mobile Bay. We estimated that this reef would have produced oysters valued at over $4,100 during the 1969 harvesting. These oysters represent a loss due to pollution, and when added to the losses mentioned above increases the dockside value to $148,997.

A study by Florida State University indicated that the true value of oysters to a community after processing and distribution, and so forth, was about four times the amount received by harvesters or four times the dockside value. If our estimated dockside value of oysters that were not harvested in 1969 due to closure is multiplied by this factor of four, then the estimated total economic loss to the area in 1969 would be $595,988 or about $600,000.

I know that this hearing today is primarily concerned about pollution of oysters. However, I think it would be a serious mistake to overlook the effects of pollution on the other fisheries resources in Mobile Bay. During the past two years numerous fish kills have occurred in Mobile Bay, Eslava Creek, Dog River, Industrial Canal, Bayou La Batre, Bon Secour River, Threemile Creek, Lower Tombigbee River and in other coastal areas of Alabama. These kills have resulted in more than 5 million dead fish. The fish kills were investigated by fishery biologists of the Conservation Department and were usually associated with low dissolved oxygen concentrations. Other losses such as the filling in of Polecat Bay have occurred. This area once provided valuable nursery areas for shrimp and other valuable marine animals and a larger place to fish. We must also remain concerned about possible high levels of pesticides and heavy metals in our estuaries and marine animals. This aspect has been discussed today by those more qualified to do so.

Shrimp and crabs have died in Mobile Bay, though. One such kill occurred in October 1967. Samples of the dead shrimp revealed concentrations of two and one-half to six and one-half milligrams per kilogram of cadmium and 25 to 57 milligrams per kilogram of chromium.

I think that the loss of sport and commercial fish and other marine life, the loss of nursery areas for marine animals, the loss of fishing areas, and the reduction of esthetic values and the reduction of areas used by swimmers and other water sport enthusiasts must not be overlooked in an assessment of pollution damages to Mobile Bay. If these damages are not considered at this hearing in determining courses of action, then I think you will be overlooking a major source of aquatic losses to Mobile Bay.

I hope that the hearing will be a catalyst for action that will result in a solution of the pollution problems that plague our oyster industry, our commercial and sport fisheries, and our recreational activities and our tourist industry.

The Federal Water Pollution Control Administration report presented here today offers conclusive proof that Mobile Bay is polluted and that pollution has caused closure of oyster reefs in the bay and resulted in a substantial economic loss to our area. There is evident need for serious study by our health authorities and other experts of the existing coliform standards for oyster harvesting areas. There seems to be a need for revision of existing coliform standards. The FWPCA study indicated that there would be periods each year when the total coliform concentrations at oyster beds in Mobile Bay would be greater than the present standard, even if complete abatement of wastes from Mobile is achieved. The report implies that fecal coliform standards or some of them would be more reasonable and recommends that a coordinated effort by the U. S. Public Health Service and FWPCA should be undertaken immediately to determine an acceptable fecal coliform count with respect to approval of areas for shellfish harvest.

I concur in the recommendations made by the Federal Water Pollution Control Administration and I urge our pollution control agencies, public health officials, and others concerned about pollution problems in Mobile Bay to lend their energetic support so that our oysters can be utilized safely at all times. I would like to see our coastal waters utilized to their full potential by other commercial fishermen, sport fishermen, hunters, skiers, bird watchers, industries, and other users who need clean water.

Thank you.

MR. STEIN: Thank you, Mr. Crance.

Are there any comments or questions?

I think you have made some very valuable contributions. One, I did have, myself, some doubt about the exact figures on the economic loss, and I think your statements are well taken. I wonder if possibly you agree that an approach might be to consider these to be substantial harvesting losses and substantial economic losses during the closure periods, without going into detail at the present time as to the specific amounts.

Is it possible to do that?

MR. CRANCE: The question is--

MR. STEIN: If the conclusion of the conferees would just be that there are substantial losses during closure without setting forth any figures, any particular figures, that might be safest at this time, don't you think?

MR. CRANCE: By "substantial" you mean at least as high as you all indicated?

MR. STEIN: At least as high, because I think they are way too low. First of all, I think they pared that to four. Just like any committee, they pared that down to four from five. I am sure they just looked at the impact on the local county as to the value of those oysters. But, our charge is to follow those oysters in interstate commerce and we have to follow it way beyond that. Before we have a specific economic loss, we probably would need to endorse a particular figure, and we probably would need some professional economist to look at all the aspects of this.

MR. CRANCE: I agree with that, to arrive at the exact figure. My point was that during 1969--

MR. STEIN: Right.

MR. CRANCE: --there was a greater loss than the averages that they estimated the previous years.

MR. STEIN: I understand that. And I think your criticism is well taken, but I think possibly the best way that we might handle that is just talk in descriptive terms at this point--possibly a substantial loss, rather than on the basis of the information that we have to put an exact dollar figure on it.

Your other point also is an extremely well taken one about these other losses. It isn't because they are not here or that we are not interested. It is just that we don't have jurisdiction under the proceeding. The only way we are in here is because of the shellfish jurisdiction. You know in Escambia Bay when we were acting under another jurisdiction, we did consider the fish kills and the toxic material. But we just can't do that under this, although we are vitally interested in it.

There is one thing about a shellfish case that you will appreciate and we all can appreciate, that the requirements for shellfish are among the highest of the water quality requirements for anything, and generally if we can protect the shellfish we have done a pretty good job on other water uses too.

Are there any other comments?

If not, thank you very much.

Dr. Myers.

DR. MYERS: Mr. Archie Hooper, of the Game and Fish Division of the Alabama Department of Conservation.

Mr. Archie Hooper.

ARCHIE D. HOOPER, CHIEF
FISHERIES SECTION, GAME AND FISH DIVISION
ALABAMA DEPARTMENT OF CONSERVATION
MONTGOMERY, ALABAMA

MR. HOOPER: Mr. Chairman, conferees, ladies and gentlemen.

In case you didn't hear, I am Archie Hooper, I am Chief of the Fisheries Section, Game and Fish Division, Alabama Department of Conservation.

The statement I have today is a statement of the Game and Fish Division of the Alabama Department of

Conservation. This statement is not confined directly to Mobile Bay and oyster production. It deals mainly with the freshwater streams which bring water and pollution into Mobile Bay.

Since 1962, fishery biologists of the Conservation Department's Game and Fish Division have conducted several research projects involving water quality of the major tributary streams emptying into Mobile Bay. These streams constitute the major freshwater supply to Mobile Bay and they provide a means of transportation for a very high percentage of the pollution entering Mobile Bay.

I am sure you will be interested in the facts uncovered by these aquatic biologists while conducting their research. One study conducted in 1964, in cooperation with the U. S. Public Health Service, revealed that the waters of the Tombigbee-Mobile River system contained a maximum concentration of only 1.9 parts per billion DDT. Most samples had much less than this. This sounds like a very insignificant amount of this insecticide. However, if our study had ended there, we could have been very happy in our ignorance.

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Since it is a basic fact that living organisms concentrate these insecticides inside their bodies, we must look further to evaluate the importance of this apparently insignificant amount of insecticide in our water. Clams collected in the Tombigbee River at that time were analyzed and found to contain 24.0 and 10.6 parts per million DDT and DDE, respectively. Of course, not many people eat Tombigbee River clams so this does not appear to be very important either. However, oysters are very similar to clams in their feeding activity and studies are being conducted to determine the total effect of pesticides on this valuable shellfish.

In 1968 and 1969 our biologists, in cooperation with the U. S. Bureau of Sport Fisheries and Wildlife, collected samples of fish from the Tombigbee River and its tributaries approximately 50 miles above Mobile Bay. This is about one or two days flow time upstream. These fish were analyzed to determine how much of certain pesticides were being stored in the flesh of these fish. Largemouth bass, collected in October 1968, contained a total of 13.33 parts per million DDT and its metabolites plus measurable amounts of dieldrin and BHC in their

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flesh. Samples of carp contained over 15 parts per million DDT, DDE and DDD combined, plus measurable amounts of dieldrin, BHC and lindane. In addition, some fish also contained more than 1 part per million chlordane in their bodies. Our most recent samples, taken during October 1969, revealed that bass in tributary streams of the lower Tombigbee River contained more than 10 parts per million DDT and metabolites, over twice the level approved by the Federal Food and Drug Administration for human consumption. The very popular food fish, mullett, had well over the 5 parts per million "safe" level of DDT. And I put "safe" in quotes because this is what the Food and Drug Administration apparently has ruled as safe in meat for human consumption.

Two points are to be made here:

These persistent pesticides have contaminated the aquatic environment immediately upstream. If they are not here now, we can safely assume that they are well on their way.

Consumers eating fish from these interstate waters are being exposed to food containing amounts of DDT and some other pesticides in excess of that level declared "safe for human consumption" by the Federal Food and Drug Administration. We in the Game and Fish Division are wondering who is going to protect us from this unhealthy food.

Do not be misled by the incomplete picture which may appear insignificant; be sure and be safe.

Further downstream, about 25 miles above Mobile Bay, our biologists observed, as far back as 1962, large amounts of fiber entering the Mobile River from an industry there. This was reported, and after several meetings and studies this industry agreed to remove this fiber waste from its effluent. As late as 1969, and you will note that we first observed it in 1962, but as late as 1969 we were still receiving written reports from our biologists attesting to the large amounts of this fiber still being flushed into the river there. It can often be seen clinging to sticks and limbs in the water's edge well over a mile downstream from its origin. No doubt a tremendous amount of this material has been transported to Mobile Bay by way of the currents of the Mobile River.

The effluent from this industry also contains zinc, a heavy metal. We have been assured that the amount of zinc entering the river is not harmful just as we were assured in 1964 that we had seen the last of the fiber waste. I'm sure you all have heard the old saying, "Once burned, twice shy."

Further downstream near the city of Mobile exists the highly polluted waters of Chickasaw Creek, Threemile Creek and the lower Mobile River. During May 1965 tests were conducted to determine approximately how long fish could live in the waters of these three areas. Healthy bluegill were placed in live baskets suspended near the water's surface and checked after 3 hours and 24 hours to determine their status. Even in May, before low-water levels and hot weather had arrived, no test fish survived the 3-hour period in two of the three sample stations in Threemile Creek, and no sample station in the lower two miles of Chickasaw Creek. When left in the area for 24 hours, no test bluegill survived in any of the three sample areas in Threemile Creek. None survived in the lower two miles of Chickasaw Creek and very few survived in any sample in the lower portion of the Mobile River.

From 1964 to 1966 a study was conducted to determine the relative abundance of aquatic insects and other fish food organisms in areas upstream and downstream from certain pollution outfalls in the Mobile Delta and its tributaries. This study indicated that the area consisting of Threemile Creek, lower Chickasaw Creek and the lower Mobile River was severely polluted. Many sample plates, anchors, and anchor wires were noted to be coated with "sewage fungus." The report concluding this study contained this interesting observation. "_It would appear that the bacteria flowing from this stream (Threemile Creek) into the Mobile River would find a super abundance of adequate media for growth in the partially decomposed organic matter flowing from Chickasaw Creek to sustain it on its trip downstream to the public oyster reefs_." The partially decomposed organic matter mentioned in the report originates from certain large industries located on Chickasaw Creek.

During recent years, our biologists have investigated numerous fish kills in the public waters of the State of Alabama. Many of these kills occurred in Dog River as a result of domestic sewage entering the stream. In 1968, this sewage was blamed for the death of more than 4,230,000 fish in Dog River. Another 531,000 fish died in Threemile Creek and Industrial Canal as a result of pollution. Pollution killed more than 5,000 fish in Chickasaw Creek that year. During the summer of 1968 over 100,000 fish, mostly game fish, were killed in the Tombigbee River from insecticide spilled approximately 60 miles upstream from Mobile Bay.

Some persons have attempted to play down the importance of the Dog River fish kills by the statement that they were only menhaden. More important than the number or species killed is the fact that water rendered toxic to aquatic life by pollution exists in this area only a very short distance from Mobile Bay oyster production areas. Water pollution is often like an oil slick, here today and farther downstream tomorrow. The difference is that we can see the oil with our naked eye. Other types of pollution are more difficult to see and much more difficult to show to someone else, but it's there just the same.

I would like to submit these reports and these research projects in toto for the record.

MR. STEIN: They will be included as Exhibits.

(The above-mentioned reports are on file at Headquarters, FWQA, Washington, D.C., and Southeast Regional Office, Atlanta, Georgia.)

I. Pollution-caused fish kill reports in the Mobile area, 1968.

1.	Dog River	5-19-68
2.	Dog River	7-11-68
3.	Dog River	7-17-68
4.	Dog River	7-30-68
5.	Dog River	7-30-68
6.	Dog River	8-4-68
7.	Dog River	8-6-68
8.	Threemile Creek	8-12-68
9.	Dog River	8-16-68
10.	Dog River	8-29-68
11.	Dog River	9-4-68
12.	Industrial Canal (Threemile Creek)	9-17-68
13.	Dog River	9-6-68
14.	Industrial Canal (Threemile Creek)	9-17-68
15.	Chickasaw Creek	9-25-68
16.	Dog River	9-27-68

17.	Dog River	9-28-68
18.	Dog River	10-4-68
19.	Dog River	10-7-68
20.	Dog River	10-25-68

II. "Relative Abundance of Aquatic Insects and Other Fish Food Organisms in Areas Upstream and Downstream From Certain Pollution Outfalls in the Mobile Delta and its Tributaries" by Wayne Swingle. First Annual Progress Report, February 5, 1965. (33 pages) Alabama Department of Conservation.

III. "Relative Abundance of Aquatic Insects and Other Fish Food Organisms in Areas Upstream and Downstream From Certain Pollution Outfalls in the Mobile Delta and its Tributaries" by Wayne Swingle. Second Annual Progress Report, February 5, 1966 (33 pages).

IV. "Effects of Industrial Pollution on the Water Quality of the Mobile Delta and Tributaries" by Wayne Swingle. First Annual Progress Report, January 8, 1965 (18 pages).

V. "Effects of Industrial Pollution on the Water Quality of the Mobile Delta and Tributaries" by

Wayne Swingle. Second Annual Progress Report, January 21, 1966 (9 pages).

VI. "A Measure of the Mortality Occurring Among Fish Held in Live Baskets Placed in Polluted and Non-Polluted Areas of the Mobile River, Threemile Creek, and Chickasaw Creek" by Wayne Swingle. First Annual Progress Report, January 12, 1965 (5 pages).

VII. "A Measure of the Mortality Occurring Among Fish Held in Live Baskets Placed in Polluted and Non-Polluted Areas of the Mobile River, Threemile Creek, and Chickasaw Creek" by Wayne Swingle, Second Annual Progress Report, January 27, 1966 (5 pages).

VIII. "Report on Pollution of Interstate Waters of the Tombigbee River System, Alabama" by Kenneth M. Mackenthun, U. S. Department of Health, Education, and Welfare, January 1965 (20 pages).

IX. Unpublished Report from Pesticide Monitoring Program. Bureau of Sport Fisheries and Wildlife, United States Department of the Interior.

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MR. STEIN: Are there any comments or questions?

MR. WHITE: I would just like to ask Mr. Hooper if you have a target date as to when you might complete the studies relating to oysters and the DDT contamination?

MR. HOOPER: I don't believe I mentioned the fact that we have a study of--

MR. WHITE: I understood you to say that-- that you are not looking into that problem in the bay at this point.

MR. HOOPER: No, sir. I mentioned the DDT contamination of fish upstream.

MR. WHITE: I misunderstood you because I thought after you made your statement about the clams that you had indicated that you were going to make a study of oysters.

MR. HOOPER: I said studies are under way. I didn't say that we are making them in the Game and Fish Commission, no, sir, we wouldn't be making such studies.

MR. WHITE: I see. Thank you.

MR. STEIN: Thank you.

Any other comments or questions?

Just wait there a moment, Mr. Hooper.

A. D. Hooper

I assure you that this is not going to be in the nature of a question, but a comment. When you come to these things you learn something. You learn things all the time.

As some of you know, for one reason or another, I inherited Water Quality Standards recently and I guess this part of the Alabama standards is already approved. I didn't realize this. This business of this industrial stream or 2 parts per million of oxygen, with two major companies sitting on that stream, and then one looks at the map and it is very close to the areas there that are completely permanently closed all the time.

Just recently--and you can read this accurately quoted in the New York Times--we were up on the Passaic River. That condition is pretty bad and the man in charge said, "After all, this isn't a babbling brook, it is an industrial stream." They asked me about that and I said, "Industrial stream is just a euphemism for open sewer."

If we are going to really talk about cleaning up this area, and I know we are talking about shellfish, I think if you look at the upper left-hand portion of the map and the permanently closed area, you can see that stream coming in there that is classified as an industrial stream. I don't think we should be kidding each other or kidding you or going back and forth that we are going to have clean waters in any area when we permit 2 parts per million of dissolved oxygen in tributary streams. I think that day in history is long past. Maybe we have it, maybe we have approved it, but I assure you now this is called to my attention and we have the standards operation, one of our charges is to upgrade the standards. I say I hope in Alabama, as anywhere else, the streams where we have these low degrees of oxygen that wouldn't even support rough fish life have just got to go. I see no place for them in this country. (Applause.)

MR. HOOPER: I wholeheartedly concur in that statement, Mr. Chairman. But even worse, this particular area is operating on a 2 parts per million dissolved oxygen average, which allows them to go to 0 one day, 4 the next day, and they think they have met their requirements. Of course the very minute they go to zero every bit of life in that stream is eliminated. So insofar as we are concerned, this is just the same as saying nothing, you don't have to have any oxygen in the stream.

MR. STEIN: That is right. But you know, with that 2 part average, when we go to zero we are not eliminating much.

MR. HOOPER: Well, that is true. (Laughter.) We have never contended that very much can survive under those conditions.

MR. STEIN: I tell you, really, and I say this to all concerned--to industry, to cities, to States, to everyone--we have a new day coming and the day that we are putting up with streams like that is passed. The sooner we get on with the job and elevate the standards the more we are going to clean this up. No wonder we have this problem here if that is what the tributaries coming in are like. This is just a disgrace.

DR. MYERS: Mr. Chairman.

MR. STEIN: Yes.

DR. MYERS: There is a discrepancy here in the testimony because the request is and the standards call for a 2 parts minimum, not average.

MR. HOOPER: I am sorry if that is in error, but I have been under the impression for a long time that their permit stated an average, Dr. Myers. If that is wrong, then I apologize, but I certainly concur with the Chairman that even 2 parts per million is not satisfactory and certainly won't support very much in the way of fish life.

Mr. Chairman, may I deviate from my statement--

MR. STEIN: Go ahead.

MR. HOOPER: --a small bit and take up a little bit of your time to ask a question that I am vitally interested in?

That is the classifications that have been applied to Alabama waters. I understand that the fish and wildlife classification has been accepted, the criteria within it has been accepted except for two very major points and this is the criteria of dissolved oxygen and temperature. Has this been resolved yet?

MR. STEIN: We are working on that with the State of Alabama and I am very hopeful that we will come up with an adequate solution.

Again I may surprise you on this because it may be the other way. But when I took this over I found that we were in a controversy on this which to my mind in examining it was largely technical in nature. The distinctions here are not distinctions which possibly might be too productive of cleaning things up. I hope we can work this out, because as far as I can see in dealing with Alabama--and some of your sister States have the same problem on this--I think the objective here of Alabama is to support the same kind of biota and fish life in those waters that we expect them to support. The difference here is really a technical difference on how to achieve it. I think the other issue in that 2 parts per million is quite different. Of course if you are not going to have much fish life there, you are relegating that to a pretty dead stream.

We have Mr. Zeller here. I wonder, Howard, if I could call on you. Have we finally resolved that Alabama issue or is that still going on?

MR. ZELLER: It is still going around, still under negotiation.

MR. STEIN: Under negotiation.

MR. HOOPER: Might I make one statement for the record? The Game and Fish Division and the fisheries biologists in the State of Alabama feel that the 4 parts per million dissolved oxygen required in the fish and wildlife classification is too low to support a desirable population of fish in Alabama. We have stated this on many occasions. We feel that it should be at least 5 parts per million.

MR. STEIN: Is that a minimum?

MR. HOOPER: That is a minimum, yes, sir, to support a well-rounded population of game fish in the State of Alabama.

MR. STEIN: May I ask you a question?

MR. HOOPER: Yes, sir.

MR. STEIN: Do you ever get natural conditions without any pollution where the dissolved oxygen falls below that?

MR. HOOPER: Oh, yes, sir. Yes, sir. We get a natural--

MR. STEIN: What would you do if this happens under natural conditions and there happen to be some discharges along the stream? The first thing everyone is going to do is turn to the discharges and point to a cause-effect relationship. If this happens under natural conditions, how do you make the distinction for administrative purposes? And I am asking you for my own information on that.

MR. HOOPER: Yes, sir. Well, I might add a bit of information. We do have certain areas, maybe in small areas where there is a lot of natural organic matter from vegetation, where dissolved oxygens are occasionally depressed even below 4 parts per million. But by the same token we have many thousands of acres of water and many hundreds of miles of large streams in the State where dissolved oxygens of below 5 parts per million have never been demonstrated by us or by the Alabama Water Improvement Commission.

So we feel that if these areas are allowed to be degraded to the point where they maintain 4 parts per million and this degradation comes about as a result of effluent from an industry or city or any other form of pollution, then certainly we are not living up to what is expected of us by the citizens of the State of Alabama as well as, I think--and you probably know this much better than I do--but I feel like the President of the United States would like to stop the degradation of any of the streams insofar as practical in the country. And we do, I repeat, we have many, many areas where dissolved oxygen concentrations below 5 or even 6 parts per million has never been demonstrated.

MR. STEIN: Yes. Well, now, I would hope the standards are not going to be used to degrade waters anywhere. Let me say this to the partisans of the higher dissolved oxygen content and others: Because I know these have been hanging fire, if we are going to work it out, we are all going to have to sit down and push. Maybe this is my next job, if I can ever get around to it.

MR. HOOPER: Yes, sir.

MR. STEIN: My notion is that you really haven't tried to mediate differences or give a little. As far as I can see, the operation may resolve itself into one of semantics. Again, as I say, I have worked with Dr. Myers and Crockett for over 20 years. They don't want degraded water in Alabama. As a matter of fact, they have devoted their careers to preserving the quality of that water. But the point is you have got to have a rule that is applicable to all.

Now, there is no reason why this rule can't be couched or framed in the language which will remove the inequities, take care of those swampy areas you talk about and those other areas and yet maintain the temperatures for 99 percent of your water in your free-flowing streams, rivers and estuaries. There is no reason why there can't be an accommodation, as far as I can see. Because it seems to me when we have a battle -- and sometimes this is inevitable and we have to work with it--with people who want to put something in the water and other people who want to keep it cleaner, then you have legitimate forces in conflict. But when you are having a controversy between parties both of whom want clean water, then I think we are making a mistake and we are kind of spinning our wheels and I hope we are not wasting our time.

What I would like to do, and this is what we always try to do--I think this is the kind of thing where you Alabamans know your waters better than anyone in the Federal Government, I don't care who he is, is ever going to know as much if you can work out this formulation yourself that we can accept, this would be great. It is only as a last resort that we would attempt to come in and try to either set these ourselves or give you the language and ask you to accept it.

Why don't you try with Mr. Zeller, who is the regional representative in charge of developing standards for the various groups in Alabama to get together, and give it one last chance and let's see if we can do it. Mr. Zeller fully well knows what we can and will accept. The reason I sent this back down here for him to try this again was because I didn't see anything but a conceptualistic difference, which really, as far as I can see, doesn't have substance. If you really mean you want to lower the quality of these waters, that is another question, but I don't think anyone does.

I will ask Mr. Zeller to try this once again.

MR. HOOPER: We will be happy to work with Mr. Zeller and with the Water Improvement Commission and do everything we possibly can to see that the high quality waters that we have left in Alabama are kept in that condition.

MR. STEIN: Yes.

MR. HOOPER: We certainly don't want to be meeting on all the interstate waters in the State because they are grossly polluted like we are having to do here today. I wouldn't wish that on my grandchildren.

MR. STEIN: All right. Thank you very much, Mr. Hooper.

Dr. Myers.

DR. MYERS: We have several members of the Legislature, both present, past and future, or at least future intended.

I would like to call first, though, on one of our present legislators, a member of the Conservation Committee of the House, Representative William Grayson of Mobile.

WILLIAM GRAYSON
HOUSE OF REPRESENTATIVES
STATE OF ALABAMA

MR. GRAYSON: Thank you.

Ladies and gentlemen, Mr. Chairman, I won't take very long. I have two things to discuss of most importance to the Mobile County people and to the oystermen and the oyster industry. Also I appear as a member of the Conservation Committee of the House of Representatives of the State of Alabama.

We have conducted several hearings in the Conservation Committee over the past year. One of them was about the fair test, the methodology of how we go about taking these tests and who takes the tests of the waters and are they polluted and to what extent are they polluted. Legislation was introduced and discussed and hearings were held to see whether or not we would get the University of South Alabama to check the University of Alabama and the State Department, check them and then the Federal Government check them, because there was a lot of suspicion that some of these fishers and other people were getting alarmed unduly. But after hearing Dr. Myers, a majority of the committee abandoned that idea, there is nothing but utter confusion, and we became convinced he was doing a good job and the Federal water commissions have stated that they had the utmost reliance upon his department and the other Alabama departments and that as long as they tended to their business as well as they have they were going to let us run our local business.

This is good news because the Chairman of the Water Commission, Dr. Myers, says that he would go along with the local people if we substantiated our mode of test. If we had a test that was good and even though it didn't apply in other parts of the country, that it would be acceptable if we could back it up, and I believe we can back it up, and I am so glad to hear him say that we are going to have local self-government and determination of our own problems. We cannot give the oystermen a fair treatment if we use the same test they use up somewhere in Nova Scotia or in Portland, Oregon, or anywhere out in, say, Hawaii or up here in the clam country. We have good clams, but there is just nobody went to the trouble to get to them and try them out down here. But there is a difference in the waters, and if we can get, like he said, our own tests and they are fair and we can market our oysters across the Nation without undue interference, then we have achieved much and we have good news today.

Now, on the bad news side, we have the

timetable about the abatement of the pollution around our waters here in Mobile. We carried on certain investigations and hearings in the Conservation Committee during the past year in the House of Representatives of the State concerning the possibility of reorganizing the Alabama Water Improvement Commission. A lot of us felt like that they were loaded with representatives of industry, that there weren't enough members on the board of the conservation group, that the polluters more or less were controlling the pollution, and that did not get very far. But we still have it under consideration. I feel they are doing a good job. I feel that they are cleaning up our waters as best they may, but they may be a little hesitant of pushing the timetable. The oystermen and the oyster industry can't wait until February 1973 to get this matter cleared up.

So I am urging a real evaluation and their going back into the timetable and see if they can't get something substantial done to clean up the oyster situation as immediately as possible so we can get the oyster beds back open and at least not close any more.

Thank you.

MR. STEIN: Thank you, Mr. Grayson.

Any comments or questions?

If not, thank you very much, sir.

DR. MYERS: I would like to call Mr. J. C. Davis, Mayor of the city of Chickasaw. I believe he has been here all day and I will give him a chance to make a statement.

Mr. Mayor.

J. C. DAVIS, JR., MAYOR
CITY OF CHICKASAW, ALABAMA

MR. DAVIS: Gentlemen, this won't take long.

Mr. Chairman, conferees, ladies and gentlemen.

I am J. C. Davis, Mayor of the city of Chickasaw. Chickasaw is a relatively small city of about 12,000 people.

The city of Chickasaw had its consulting engineers review the report on pollution affecting shellfish harvesting in Mobile Bay. Frankly, we were startled that we were a polluter. We take some comfort in the fact that we are in the 5 percent group.

We wish to advise that the city of Chickasaw was one of the first communities in the entire area to have sewerage treatment facilities. When these facilities became obsolete and were abandoned, in 1964 an updated method of treating wastes was constructed at a cost of $386,236. In addition the city recently spent $869,502 in installing sewers to eliminate the overflowing septic tanks. This means that we have already spent over $1,255,000 in our efforts to avoid contributing to the pollution of our waterways.

The technical information that we have has always indicated that stabilization ponds, which we now have in use, are very efficient in bacteriological removal. However, if the bacteriological count in our present effluent is shown to be of significance and endangering the health of our people, then you may be assured that we will cooperate in every way possible, because our city wants to be good neighbors.

When the technical staff of the FWPCA and the staff of the Alabama Water Improvement Commission determines the proper criteria, we will be happy to try to comply. We did not know we were--we felt we were in compliance until this report.

Thank you.

MR. STEIN: Thank you, Mayor Davis. Is there any comment or question?

Before you go, I want to say I do think you probably should have felt you were in compliance. It wasn't that you weren't. I think the rules may have been changed a little.

MR. DAVIS: Right.

MR. STEIN: Now, after hearing the Federal and the State report I am not sure that the State and the Federal people agree on the efficacy of chlorination of effluents from a lagoon. The Federal people think it can be done and are pretty sure it can be done. It is a new technique and can be acquired. However, I do think that this is a question that has to be ironed out certainly between the State and Federal authorities before you will be required--I hope before you will be required to do anything, because we still have some differences in the testimony here that we have to resolve either in executive session or thereafter before we will get a program.

But let me say, I do think that as far as I can see the city of Chickasaw has put in the best possible treatment that they knew how. It is just that in analyzing this report and in dealing with shellfish needs which require the highest quality of waters, the thought was in the Federal report that even additional requirements were needed in the chlorination of the effluent from your lagoon. As I indicated, if you listened to Mr. Crockett's statement, he didn't think that that could be done feasibly, and in a quick check while you were speaking on this with our people they think it can. This is something that I am sure we will try to resolve with the State people and you will be hearing from us.

MR. DAVIS: We will await your decision.

MR. STEIN: Thank you very much.

We will stand recessed until 9:30 tomorrow, same place.

MORNING SESSION

WEDNESDAY, JANUARY 28, 1970

(9:30 a.m.)

MR. STEIN: Let's reconvene.

Mr. Crockett for Alabama.

STATE OF ALABAMA PRESENTATION

(CONTINUED)

MR. CROCKETT: Mr. Paul F. Marsden, representing the Scott Paper Company.

PAUL F. MARSDEN, MANAGER
PRINTING AND CONVERTING MILL
SCOTT PAPER COMPANY, MOBILE, ALABAMA

MR. MARSDEN: Mr. Chairman, my name is Paul Marsden and I am Plant Manager of Scott Paper Company's printing and converting mill located at Mobile, Alabama. My responsibilities include the effluent treatment program for the Mobile Mill. We are pleased with this opportunity to present our views on the water quality matters raised in the report which forms the basis for today's conference.

Scott Paper Company and its predecessor at

Mobile--the Hollingsworth and Whitney Company--have demonstrated a concern for improving the water quality in the Mobile River and Bay since construction of the mill in 1940 through the installation of comprehensive waste control facilities. We are still concerned today about water quality and our efforts are directed on an operational, day-to-day basis and research basis towards obtaining improved water conditions. We are very concerned about the oyster industry's problems associated with intermittent closure of portions of Mobile Bay. Scott is also prepared to proceed further with its water quality improvement efforts where it can be demonstrated that such action will benefit other water users.

The waste control system initially installed in 1940 at our site was composed of two settling ponds totaling about eight acres for treating the effluents from the original 200-ton mill.

From these beginnings there has been a steady and substantial increase in the facilities that treat and control wastes from our present-day pulp and paper making complex. In our opinion, the waste control facilities at Scott's Mobile plant have no peer in the pulp and paper industry.

We, therefore, believe the conference report tends to minimize Scott's very substantial waste control accomplishments at Mobile. On page 19, the report states that "Within the past few years, Scott Paper Company has constructed secondary treatment facilities..." Actually, Scott's activated sludge-type secondary treatment system was started up in 1961 and expanded in 1964-1965. It remains the largest facility of its kind in the industry and its excellence won for Scott the "Governor's Conservation Award" sponsored by the Alabama Wildlife Federation in 1962.

The facility performs within the effluent limitations prescribed by the Alabama Water Improvement Commission. We note, on page 20, a statement that the waste disposal practices of two named companies are considered to be adequate by the Alabama Water Improvement Commission. Since we are in compliance with all existing orders of the Commission, we believe this recognition should likewise be given to Scott.

Scott's investment in improved water quality for the Mobile area has been substantial. The capital costs of the present system are in excess of $3 million, while the annual operating cost is $500 thousand.

I would like to show you a few slides of our effluent treatment program at our Mobile mill.

(The following commentary accompanied the showing of slides:)

Slides 1 and 2 are just general views of the overall treatment facilities.

Slide 3 is a schematic of an activated sludge treatment process.

Slide 4. Here we see our 320-foot diameter primary clarifier with a volume of 9 million gallons.

Slide 5. A multi-purpose installation feeds effluent into our waste treatment facilities where it then flows by gravity to the secondary system.

Slide 6. From our lift pumps our effluent flows through the primary clarifier.

Slide 7. Where you see this truck under a discharge chute, we haul approximately 55 tons a day of solids from our effluent and it is trucked away from our plant for landfill.

Slide 8 is a view of our secondary treatment aeration basins.

Slide 9. Our surface aerators supply oxygen for the destruction of the organic matter.

Slide 10 shows the effluent discharge ahead of our continuous sampling station.

Slide 11 is a sample of a sampling station which continuously monitors our effluent on a 24-hour-a-day basis.

First, let me emphasize that Scott is concerned that oyster beds in Mobile Bay are closed from time to time and that this results in some economic loss to area residents. We have no reason to believe, however, that the specific waste control recommendations contained in the report would, if implemented, resolve this situation. The fact that there is some question among the Federal researchers on this point is acknowledged on page 46 of the report where it is stated that, "...total coliform concentrations at the oyster beds will be significantly greater than the shellfish standard even if complete abatement of wastes from Mobile is achieved." This is attributable to the very large numbers of coliform organisms contributed by land runoff during high freshwater flow periods.

We believe the probability is extremely remote that Scott's present discharge could have an adverse effect on the oyster beds. Nevertheless, to reinforce our commitment to water quality improvement in the Mobile area, we are willing to undertake the separation of mill process and sanitary wastes, despite the fact that we have reservations regarding the effectiveness of this program in solving this particular oyster bed problem. The need for additional disinfection measures for our process effluent is eliminated when all possibilities of it being fecally contaminated are removed.

Scott has three principal reservations to the recommendations contained in the report. These are:

(1) The recommendations are not based on adequate sampling and, in some cases, are not substantiated by any field data.

(2) The recommendations appear premature in view of the Alabama Water Improvement Commission's abatement program in the Mobile area.

(3) The bacterial identification procedures used are not specific to fecal organisms.

P. F. Marsden

I would like to expand on each of these points.

1. Inadequate Sampling

The report recommends very comprehensive remedial measures for the waste dischargers in the area based on what, in our opinion, are rather meager sampling data. For example, the Scott effluent was sampled during only one 24-hour period. No attempt was made as far as we can tell to use tracers to actually establish the patterns of waste distribution into Mobile River and Bay.

We submit that this is insufficient data on which to base recommendations which could entail expenditures of millions of dollars.

The recommendation that industrial process water receive secondary treatment at not less than 85 percent BOD removal at all times is completely unsubstantiated. We also find no evidence in the report that such a program would favorably affect bacterial conditions in the vicinity of the oyster beds.

The proposal that mill process water be disinfected even after separation of sanitary sewers is particularly difficult to understand. We estimate that disinfection of our treated process water by the commonly accepted method of chlorination would result in additional operating costs to Scott of approximately $1,400,000 annually. This would be an increase of about 300 percent over our present treatment costs. In our opinion, to disinfect in the known absence of fecal contamination is unjustified.

2. Mobile Area Abatement Program

The Alabama Water Improvement Commission is pursuing a vigorous abatement program in the Mobile area. This program will result in construction of additional treatment facilities at three of the industries cited in the report, collection and treatment of sewage from the downtown area of Mobile and other improvements. Almost 60 percent of the total "fecal coliform" contribution from the Mobile area is attributable to the downtown section alone. We ask: Would it not be more prudent to evaluate the effects of the Commission's program--one that is proceeding in a timely manner--before promulgating new regulations which, by the report's own admissions, give little hope of providing a solution to the problem? During this interim period many of the uncertainties regarding the present bacterial indicator tests, a subject which I shall discuss in a moment, should also be resolved leading to sounder requirements on a total basis.

3. Non-Specific Nature of the Bacterial Indicator Tests

The report on page 46 states that the present shellfish standard appears to be "unrealistic" and urges a coordinated effort by the U. S. Public Health Service and FWPCA to develop acceptable numerical criterion for "fecal coliform." We strongly endorse the search for more meaningful criteria, but believe that the Report's research recommendations may be too restrictive in this regard. Use of the "fecal coliform" test, without further diagnostic procedures or examination for physical presence of sanitary sewage or other vectors, could also lead to erroneous interpretations.

Our industry has given considerable attention over the past several years to the question of the sanitary significance of pulp and paper mill effluent discharge. The survey and research work on this matter for our industry, which has been spearheaded by the National Council for Air and Stream Improvement of the Pulp and

Paper Industry (NCASI), was prompted by the increased emphasis on receiving water quality standards resulting from implementation of the Federal Water Quality Act. It is our understanding that the FWPCA has also given much recent consideration to this matter as evidenced by its Recommendation No. 4 calling for an accelerated research program on the bacterial identification problem. Renewed emphasis has been focused on the long established fact that the traditional indicator organism of the possible presence of sanitary sewage, namely the aerogenes or coliform group, included organisms that normally inhabit the soil but that are also found in other habitats.

The National Council is studying several facets of this coliform problem as it relates to pulp and paper mill effluents and their effects on receiving waters. The area of particular interest to this proceeding is that which relates to the specifics of bacterial counting techniques. National Council studies have proceeded to the point where several approaches for resolving the identification problem are suggested. First is the use of additional diagnostic procedures, such as the IMViC test to determine whether intestinal source organisms are present in excessive numbers. Second is by selection of other procedures for counting other true human intestinal-dwelling organisms, or actual pathogens. We believe the suggestion in Recommendation 5 in the report that Salmonella determinations be employed in conjunction with fecal coliform criterion is a significant step in this direction. Thirdly, and very importantly, the National Council studies suggest that indicator tests be accompanied by surveys seeking firm evidence of sanitary sewage contamination of receiving water surveys before requiring remedial disinfection measures.

In conclusion, Scott would like to assure the conferees and the people of this community that it intends to continue its efforts for water quality betterment in the Mobile area.

The commitment to separate the sewer system involves very substantial investments on our part as none of our sanitary wastes are now connected to the municipal system. (The report on page 19 erroneously states that half of our sanitary wastes is discharged to the municipal system.) The preliminary capital cost estimate for separation, collection and on-site treatment of our sanitary wastes is approximately $1,000,000.

We are uncertain at this time as to how the disposal of our sanitary wastes will be accomplished. The alternatives are construction of a treatment plant on-site or discharge to the city of Mobile municipal sewerage system. Unfortunately, there are no municipal sewers in the immediate vicinity of our mill on Bay Bridge Road, and some further exploration of the feasibility of this latter approach is required. In any case, the separation and disposal of the sanitary sewage will be in accordance with Alabama water quality standards.

I would like to thank you for your attention and appreciate the opportunity to take part in this hearing.

MR. STEIN: Thank you, Mr. Marsden.

Any comments or questions?

MR. WHITE: I would like to ask Mr. Turner and Mr. Gallagher if they have any comments. None?

I have no questions.

MR. STEIN: That was a very constructive statement, as Scott's statement usually is. I think we have a few points that we should clear up.

One, you said, "the conference report tends to minimize Scott's very substantial waste control accomplishments at Mobile....and believe recognition should apply to Scott."

I agree with you. I have said time after time that Scott has put in a tremendous facility in Alabama, in their plant in Alabama; and you have done a great job in putting facilities in Pennsylvania. Most of the time I have said this it has been in the Pacific Northwest, and I wish you would do the same thing out there. I have pointed to your Alabama accomplishments many, many times in the Puget Sound area and given you full credit for it because I think you have a wonderful facility here.

But let me ask some questions. What kind of BOD reduction can you get when you operate this, recognizing that you may have differences with the 85 percent, but given the existing facilities what kind of BOD can be achieved and are you achieving?

MR. MARSDEN: We work on the basis that you mentioned yesterday, I think, as perhaps a sounder basis than a percent reduction to the degree that we watch the pounds of BOD going in the river as our criteria.

MR. STEIN: Yes.

MR. MARSDEN: We do not run, perhaps, on a controlled and regular basis and efficiency factor for the secondary system. We do this periodically as we make changes to try to get some indication of the effect of the changes and we run anywhere from 85 to 87, 88 percent at various times.

MR. STEIN: Let me again say that in dealing with the Scott Paper Company throughout the country, I have found, 1) that we always have had a wonderful full exchange of information with the company, and 2) I would say, and say it publicly, that the reliance on their information or their figures is something which I would vouch for. I think they are certainly as reliable and as accurate as the Government figures. As far as I can see there is no difference in the integrity of either. Scott has always had a fine record on that and I would like to make that clear.

The information they give has always proved to be accurate. We have found that when they have a plant waste disposal system they run it in a rather efficient manner.

So really your plant would be in the ball park of what--at least the physical facilities of what they are asking, at least in terms of pounds per day or percentage of BOD reduction now.

MR. MARSDEN: Well, on pounds of BOD we are in compliance with the water commission standards.

MR. STEIN: I understand this.

MR. MARSDEN: Now, on a percentage basis, our number--we have not been able to consistently run our secondary system up until this point at an 85 or better level on a day-to-day basis. This is tested only periodically from an efficiency standpoint.

MR. STEIN: Then if we go in for a higher program, there may be some other things needed.

Recognizing that you are complying in your present operations with all the Alabama requirements, there is nothing to prevent you, with your existing system, if the Alabama requirements or the Federal requirements or both demand it, from running that plant of yours on a year-round basis, is there?

MR. MARSDEN: No. Without going into the background on the basis of why we have been running this summer-winter, it boils down to the oxygen demand of the river, where we have not been able to establish that not running it when the temperatures are low and the water is at saturation or very close to it, the effect of running the secondary system would not affect the oxygen content in the area, even immediately adjacent to the mill or below Cotton River Bridge. Our discussions with the Alabama water group have been that we will run our system year-round and we would plan to start this next fall.

We have had some other logical reasons for not doing it during the winter. One, our system is the largest system in the industry and we have had, as you do, operational problems to the degree of scheduling maintenance and maintenance time to be sure that the system is completely reliable during the more critical periods, and this was one of the rationales for giving us two months during the system to get into the aerating secondary system and properly maintain these.

MR. STEIN: I understand that. I don't want to get the economics of this, but sometimes you can almost do better with a year-round operation rather than a start-up and a shutting it down. Because all these systems, unless this is any different--and I have seen the pictures, I have a pretty good idea of what they are--they need a shakedown period. This is not the kind of system--and you people who aren't familiar with this really should know--it is not the kind of thing that you just throw a switch and something goes on like a light goes on here and you don't worry about it. It is really an art to run this. I am not sure, and this is one of the things that was bothering me, that I think the problem of the shutdown and the start again might give you so much off time that the time you really need to work the bugs out might cut into really the optimum operation of the system when you need it at a crucial period.

So I think really you should consider running this on a year-round basis.

MR. MARSDEN: That has been discussed with Mr. Crockett--that around next fall we will do this.

MR. STEIN: Right. There is one other thing. And I say this to your industry, not only to Scott because I know you have been thinking of this, but to all the other people in the pulp and paper industry here as well as the allied industries. I recognize your views on the disinfection of paper mill wastes. But when you say you just have an oxygen problem and that was your rationale for not running the treatment plant during the winter, you assume you don't have any bugs or pathogens or deleterious material or what-have-you. The point is, the human wastes from the people in the plant not being separated, and it is going to cost you a million dollars to separate them now. If you take human waste,and put it in a medium such as the water running through a pulp and paper mill, at the temperatures which are ideal and with sugars, this might be, according to biologists and bacteriologists, an ideal culture medium for bacteria in these wastes. Then someone raises a question of the quality of the water that is coming out and asks for a disinfection. I think we have to face whether an industry or the plant not separating the human wastes from the plant wastes, given the kind of organic wastes you have in the pulp and paper mill, can get by with this. I think we have a very real problem and something that we have to work out together. And I think we would be in much better shape by getting the regulatory agencies and the pulp and paper industry together on this question and narrowing the gap on "to be or not to be" for disinfection.

If we could say that there were no sources of human wastes going into that process water, I think this would make the situation much more simple for us to deal with, because actually the control we have is not--we can't make you go into the plant and make you change your pipes. This is up to you. However, we do have a control of what you put out into public waters. And again, if you look at your figures, the costs that you have for separation would be a million dollars and it would cost you more than that,according to your own figures almost one and a half times as much, to disinfect annually. This is just an annual cost.

So I would say that if we--and I see this issue coming up not only here, that is why I am taking your time on this now, and I know the representatives are here from the industry, not only here but in other places--I think we will be much closer together if we can at least eliminate the question of so-called sanitary wastes going into the process water. Otherwise, I think we are going to have a very awkward situation.

MR. MARSDEN: Well, I would agree. I think there are research and studies going on as to what the exact constituents of pulp and paper mill wastes are, irrespective of the sanitary sewers. And all indications are that this has not been established. Conversely, as techniques improve and--

MR. STEIN: Let me say this. We have been through this before. Professor Mallmann yesterday talked about Gelreich. As you know, Gelreich is a very old colleague of ours and has done our microbiological work ever since Harold Clark died. Now, the point is: Let's suppose we follow your suggestions here on a more precise basis. Let's suppose we get Gelreich down here to examine this and let's suppose, just for the sake of argument, he comes up with some salmonella in pulp and paper mill wastes and not one of those 400 varieties that don't affect humans, but salmonella or some other bug that has an effect on humans. And then he comes up with the notion that this waste has to be disinfected in order to preserve water quality, as he has done in several other places where we have had him involved. It does very little good to say that you have these interconnections of wastes or to speculate are you getting bugs from the tree. The point is, if Gelreich has found this--and by the way there is no "d" in that name, as it was put in in the paper here yesterday--but if he finds it in the effluent, that is all the regulatory agency is concerned with.

That is why I am suggesting that we recognize what you think is a tremendous cost for a minimal benefit. It seems to me that if we are going to try to arrive at an accommodation on this, the mills must meet us halfway and at least think about a program to eliminate the sanitary wastes in the process waters.

MR. MARSDEN: We would agree with this.

MR. STEIN: Right. Thank you very much, sir. Mr. Crockett.

MR. CROCKETT: Mr. Paul Dumas, representing National Gypsum Company.

PAUL J. DUMAS, WORKS MANAGER
NATIONAL GYPSUM COMPANY
MOBILE, ALABAMA

MR. DUMAS: Mr. Chairman. My name is Paul Dumas, and I am Works Manager for the National Gypsum Company. This will be very short.

We started our program in cooperation with the Alabama Water Improvement Commission over two years ago. National Gypsum Company engaged as consultants Dorr Oliver, a widely recognized authority on water treatment problems. Working with Dorr Oliver, our company engineers developed a two-phase program which was submitted to and approved by the Alabama Water Improvement Commission. Phase one of this program involved the installation of screens, save-all equipment, collection chests, clarifying equipment, as well as extensive in-plant modifications to retain solids within the process and to clarify the wastewater. This program was activated ahead of schedule at a cost of over one-third of a million dollars. Phase two of our approved program is now in the engineering stages and involves design, selection and installation of equipment to reduce BOD content of our wastewater.

So far this meeting has been heavily technically oriented and I have neither the expertise nor the qualifications to take part in the technical facets of the problem. It seems to me that there is a more compelling moral responsibility, and we would like the Chairman to understand that we are aware of our moral responsibility and that the Water Improvement Commission will surely keep us advised of our technical responsibilities.

MR. STEIN: Thank you.

MR. CROCKETT: No questions, Mr. Stein, but I do have a comment.

After the first stage of the National Gypsum Company's improvement program, that of installing the clarifier and other equipment to remove solids, the next approach will go into biological treatment, and one approach which will be investigated is connection to the Mobile sewerage system where this waste would be treated in the Mobile's McNellie Island activated sludge plant.

MR. STEIN: Thank you.

Are there any other comments?

If not, thank you very much.

MR. CROCKETT: Next is Mr. M. M.Schirtzinger, representing Stone Container Corporation.

M. M. SCHIRTZINGER
CONSULTANT, STONE CONTAINER CORPORATION
CHILLICOTHE, OHIO

MR. SCHIRTZINGER: Representatives of the Alabama Water Improvement Commission and of the Federal Water Pollution Control Administration, ladies and gentlemen.

I am M. M. Schirtzinger, a consulting engineer retained by and representing the Stone Container Corporation.

Stone Container Corporation, with 22 manufacturing and converting facilities located in the United States, is vitally concerned with water quality and environmental control on both a regional and in local water basins.

M. M. Schirtzinger

Referring to the problem of bacterial pollution of Mobile Bay we would like to comment on each of the several recommendations contained in August 1969 report. "Pollution Affecting Shellfish Harvesting in Mobile Bay, Alabama," prepared by the Federal Water Pollution Control Administration.

Referring to Recommendation I:

We concur with recommendations for secondary treatment and effective disinfection for all municipal wastes and for the construction of interceptor sewers for the downtown section of Mobile. The discharge of raw sewage and inadequately disinfected sewage directly into Mobile Bay contributes the greatest public health hazard relating to the infection of shellfish.

Referring to Recommendation II:

a. We concur with the requirement for the separation of sanitary wastes from process waters.

And incidentally, there is an error in the report which indicates that the Stone Container Corporation does not treat its sanitary sewerage nor does it have any treatment facilities. We had separated the sanitary sewerage from the plant in 1955 whereas the report indicates or seems to indicate that we have not adequately handled our sanitary sewage problem. Also the report indicates that no treatment is being provided by the Stone Container Corporation when actually a primary clarifier has been installed and operating for some time.

It has long been practiced by the Stone Container, and we feel it is essential, to eliminate all possibilities of pathogenic organisms from process waters and mill effluents.

b. Paper and pulp mills effluents do show high total and coliform bacterial counts on occasions. They are not of health significance, however, when sanitary sewage is not present, but are aerobactor aerogenes and soil organisms.

c. We, therefore, advise that disinfection of effluents should be limited to those which have a potential for containing pathogens and that the present test for total and fecal coliforms are not true indicators of this potential. Data collected by the National Council for Stream Improvement indicates that so-called fecal coliform counts (as presently performed in accordance with standard methods) is not a true indicator for the presence of pathogens when the wastewater is from a pulp or paper mill.

Referring to Recommendation IV:

The Stone Container Corporation has submitted a timetable for water pollution abatement to, and has received the approval of this timetable from,the Alabama Water Improvement Commission. The company has cooperated fully with the Commission and plans to construct secondary waste treatment facilities by the end of this year rather than the 1973 date.

During 1969, a vigorous program of water conservation and reuse has been undertaken. This has resulted in a reduction in wastewater volume discharged from an average of 400,000 gallons per day in 1968 to 240,000 gallons as a monthly average for December 1969, and it has resulted in a 40 percent reduction in pollution load. This is, of course, after primary clarification. Going back to 1960 the average water use was 500,000 gallons per day and as far back as 1950 was over 2,000,000 gallons a day.

It is the company's goal to have a completely closed water system. A request for a Demonstration Grant has been submitted to the Federal Water Pollution Control Administration Research and Development Group to obtain support in this goal and we hope to develop new techniques which are applicable throughout the industry.

Referring to Recommendation V:

We concur with the recommendation to determine a reliable indicator which can be used in conjunction with the total and fecal coliform criterion for establishing areas acceptable for shellfish harvesting.

Quoting from the National Council for Stream Improvement, "Our general findings are that the total coliform procedures represent useless criteria of the sanitary significance of paper mill discharges where sanitary sewers have been effectively segregated. Further, the so-called fecal coliform counts, while generally 0.1 to 10 percent of the total presumptive counts, are also poor indicators, since the organisms counted invariably prove out to be a. aerogenes. In contrast to e. coli, the former cannot rationally be considered as an indicator of fecal contamination, particularly where e. coli appears to be absent.

"Our findings support our contention that test temperature conditions are designed to insure counting of a measurable fraction of the a. aerogenes as well, and subsequent misinterpretation of results unless additional diagnostic work has been done."

With background bacterial pollution in the Mobile River upstream of the Mobile metropolitan area, we feel that further sanitary studies should also be made to determine the source of these organisms and particularly the resuspension of bottom deposits during high stream flows.

Gentlemen, we thank you for the opportunity to present this statement. It has been our desire to make our comments constructive and to indicate progress in water pollution abatement by the Stone Container Corporation and to assure you of our fullest cooperation.

MR. STEIN: Thank you, Mr. Schirtzinger.

Are there any comments or questions?

MR. WHITE: I would just like to add one comment here.

With reference to the statement that our report was in error concerning your treatment, I believe on Table 7 you will see that this was left out. We weren't sure of the status of your treatment facilities. And on page 20 there is an indication that you do have some treatment facilities because we say "additional treatment is being required by the Alabama Water Improvement Commission."

MR. SCHIRTZINGER: Yes, but there is also an error where it says this is to remove color--

MR. WHITE: Well, to remove color is what--

MR. SCHIRTZINGER: --and we don't have any requirements to remove color.

MR. WHITE: I beg your pardon?

MR. SCHIRTZINGER: The Alabama Water Improvement Commission has said nothing to us about color, so that is in error also.

There is also an error on the page where it says that the four companies do not provide adequate treatment for sanitary sewage and of the previous four that are named we are one of them. I think that is incorrect. The status of the report with regard to our treatment of sanitary sewage and the status of our primary facility is not correct.

MR. WHITE: O. K.

MR. STEIN: Are there any other comments or questions?

I think that is the purpose of this, the reason why we asked you to come here, is to ascertain this.

Let me ask you, though. I am delighted to hear that you have got all your wastes separated, but you say you are running this to a primary clarifier. Have you any plans to give your domestic sewage secondary treatment for this program?

MR. SCHIRTZINGER: Our sanitary sewage has been separated and discharged to the city of Mobile since 1955.

MR. STEIN: It is going to the city?

MR. SCHIRTZINGER: Yes, which is a good indication of the fact. We have no further requirement for treating our sanitary sewage. It has been segregated for a long time.

MR. STEIN: I don't think you made that quite clear that it is going to the city of Mobile.

MR. SCHIRTZINGER: Yes. And therefore, we take the position that disinfection of the effluent is of questionable value.

MR. STEIN: That may be. But I have one question on that. Do you use wood pulp or do you reprocess paper?

MR. SCHIRTZINGER: No, we use secondary fiber recovery.

MR. STEIN: Secondary fiber recovery. In other words, you use old board and old paper?

MR. SCHIRTZINGER: That is right.

MR. STEIN: I don't know that the conclusions made by the National Council for Stream Improvement go that far. You see, you quoted total coliform criteria, and I don't know anyone who suggests total coliform--that may be a straw man, it is a fecal coliform with someone else--where sanitary sewers have been effectively segregated. Largely they are dealing with plants that have been segregated or where you are not using old board or old paper. Now, the question here is you may have one problem on the lack of pathogens or materials of that kind where someone goes out to the woods, fells the trees, brings them in, barks them and chips them and runs them through, but you may have another question really where you are using used fibers.

MR. SCHIRTZINGER: Your point is probably well taken. I think what we are saying is that considerable study needs to be made in this area of microbiology. We know, for example, though, that in our process the temperature at which the paper machine operates would pasteurize the waste, so we are questioning when you run these tests what does that really mean in terms of the presence of pathogens.

We think that considerable study and research work needs to be done to identify what is the true significance of these coliform counts and even fecal coliform counts when you are dealing with pulp and paper mill effluent. We recognize that they are present and can be detected by present methods.

We are saying what is their true health significance and that the present state of the art is not well defined in this particular area and considerable research work needs to be done to establish a really meaningful criteria.

MR. STEIN: Do you want to comment, Mr. Crockett?

MR. CROCKETT: I have a question, Mr. Schirtzinger.

Has consideration been given by Stone Container Corporation to the discharge of this treated and reduced flow of wastes to the Mobile sewerage system?

MR. SCHIRTZINGER: Yes. We are considering this as one of the alternatives.

In viewing the possibilities for municipal waste treatment of paper mill wastes, of course, we think that in the long term or in the long pull our best approach to this problem will be one of as nearly as possible complete water reutilization. Of course we have a different kind of a problem in board mill and secondary fiber water use and a different requirement for water quality than do the people who are doing virgin pulping and leaching. But we think that we have made substantial progress in water conservation and we are continuing to make efforts to close our system. We think that in the long pull this will be our best approach and the most permanent solution to the pollution problem. This meets the treatment requirement not only from us but also from the city of Mobile, and presumably they have a treatment expense, and you are always going to get a degree of treatment.

If you can achieve complete water reuse as a goal, I would say we have a permanent solution to water pollution abatement.

MR. STEIN: Yes.

MR. CROCKETT: We certainly agree with you.

MR. STEIN: We might agree too. I stopped because I wanted Mr. Crockett to make his comments. But when you talk about this research and further work having to be done, I agree with you and I think this is echoed by most of the industrial spokesmen.

I hope you are right on that pasteurization. While recognizing the need for this research we may have our people look at your effluent as a particular case. Now, if they find material in there, we are going to make conclusions not on an industrywide basis but on the basis of the particular effluent. I would agree with Mr. Crockett that if any industry can discharge its wastes to the municipal system, as you are doing your sanitary wastes, the industry is free from the technical and legal responsibility of reporting to the Federal Government or to the State, the city has to, and it might behoove you to do this.

While we are all in agreement, this is the message I want to convey on the need for research; we are going to proceed with this problem in the case of the Mobile area on a discharge-by-discharge basis. And I don't think we need research to send our microbiologists out to perceive if there is any indication that there are organisms in there which require treatment.

MR. SCHIRTZINGER: Well, I--

MR. STEIN: And I can assure you these are going to be more sophisticated tests than the total or fecal coliform.

MR. SCHIRTZINGER: I would agree with you. I would add, too, that I think pathogenic micro-organisms you can probably find in the environment in almost any particular location. It is not only a question of whether or not you can find one particular salmonella in a paper mill effluent, but it is a quantitative thing, how many are there. I could probably find a salmonella maybe underneath my shirt collar, but what is the real sanitary significance of this?

MR. STEIN: Again I think on the basis of that I would agree with that, and then our scientists would be asked for their opinion on what this means in that particular effluent.

So I suggest that while we do need this research, any closed system or hooking up to a municipal system or trying to narrow the gap on this would be a better solution to the problem, because if we have these beds closed we are going to examine every source in this particular area to be sure that they are taken care of. And if you are discharging directly into a public water and our people think that that might be a likely source that is causing the problem with the shellfish beds, our people are going to be out there sampling the effluent

Are there any other questions?

If not, thank you very much.

MR. CROCKETT: Mr. C. D. Haig, Jr., General Traffic Manager, Alabama State Docks.

C. D. HAIG, JR.

GENERAL TRAFFIC MANAGER

ALABAMA STATE DOCKS
MOBILE, ALABAMA

MR. HAIG: Mr. Chairman, distinguished conferees.

My name is C. D. Haig, Jr. I am General Traffic Manager of Alabama State Docks Department. My address is Post Office Box 1588, Mobile, Alabama, 36601.

I wish to offer a very brief statement of Houston H. Feaster, the Director of the Alabama State Docks Department. Mr. Feaster's statement is in the form of a letter dated January 27, 1970, addressed to the Federal Water Pollution Control Administration.

"Gentlemen: This is to advise you that our engineers have under active study the method of removing from Mobile River pollution that originates at the Alabama State Docks. Due to the great many small outlets this is a complex job, but we expect to have an answer to it within the next six months and expect to have the facilities in operation well in advance of February 1973.

Yours very truly, Houston H. Feaster, Director,

Alabama State Docks Department."

MR. HAIG: That is all I have, Mr. Chairman.

MR. STEIN: Thank you, Mr. Haig.

Are there any comments or questions?

Thank you very much for your statement.

MR. HAIG: Mr. Chairman, I will hand the original letter to the reporter and ask that it be received in the record.

MR. STEIN: Without objection that will be done. Thank you very much, sir.

(Which said letter is as follows:)

ALABAMA STATE DOCKS DEPARTMENT
MOBILE

HOUSTON H FEASTER
DIRECTOR

January 27, 1970

Federal Water Pollution
Control Administration

Gentlemen:

This is to advise you that our engineers have under active study the method of removing from Mobile River pollution that originates at the Alabama State Docks. Due to the great many small outlets this is a complex job, but we expect to have an answer to it within the next six months and expect to have the facilities in operation well in advance of February, 1973.

Yours very truly,

Houston H. Feaster
Director

HHF:bsg

MR. STEIN: Mr. Crockett.

MR. CROCKETT: Mr. J. A. Stalcup representing the Mobile Board of Water and Sewer Commissioners.

JOHN A. STALCUP, SUPERINTENDENT
MOBILE WATER SERVICE
MOBILE, ALABAMA

MR. STALCUP: Mr. Chairman, Mr. Crockett, Mr. White, ladies and gentlemen. I am John Stalcup, Superintendent of the Mobile Water Service, and I am making this presentation because Mr. Dennis Moore, the Chairman, had to go to Florida on business. He stayed here until noon yesterday.

Mobile initiated plans for abatement of pollution, without duress from anyone, in 1948. It initiated these plans when pollution abatement was not the popular movement it now is and this took both foresight and courage. It was on its own when it had to start educational programs to convince its own people of the desirability and necessity of the abatement program it planned to undertake. At the time, one of the major considerations was the protection of oyster beds in Mobile

Bay.

Mobile has had a program in progress on a continuing basis, not stop and start, but solid year-by-year accomplishments since 1948. Mobile has been a leader in the pollution fight and we are gratified that in a recent study of Mobile Bay Estuarine System by Tanner, Brett, Ryan and Stapor it was stated, and I quote, "Progress made by municipalities of the area in constructing sewage treatment facilities is remarkable in view of the fact that prior to 1949 only Chickasaw and Fairhope provided sewage treatment and this treatment was limited to plants of the primary type." This recognition is appreciated, especially so from this group. I am sure this commendation will also be appreciated by our citizens who bear the financial brunt of these efforts.

While on the subject of financial burden, I think it would be well to cite a few figures to show the trend that has occurred. In 1948 the average cost of water service to each of the 25,896 water customers was $2.90 per month. In 1969 the average cost to each of the 53,150 customers, for water plus waste treatment was $7.68 per month--an increase of $4.78. The minimum bill in 1948 was $1.12 and in 1969 was $3.25.

By the accepted standards of good practice that existed up to the present time, we will this year have completed the major portion of the program we started in 1948. We agree with the statement previously quoted that this was a remarkable job and we want to take five or ten minutes later on to show you by colored slides what was done in the metropolitan area. We think anyone seeing these will recognize the efforts we have put forth and the progress which has been made.

With respect to the present report presented here today, it contains the general recommendation that all plants in the area be operated to accomplish the highest possible removal efficiencies at all times, and in addition there are three specific recommendations concerning Mobile. We comment as follows:

(1) With respect to the general recommendation, we do and will endeavor to operate at best efficiency;

(2) Next, with respect to the recommendation concerning construction of interceptor sewers for diversion to McDuffie Island plant of wastes from downtown Mobile,

we appropriated money several years ago for this project, but could not proceed until plans for the I-10 tunnel and urban renewal were finalized. This project is again funded, is under construction and will be complete this year.

A second recommendation: At the Threemile plant - effective disinfection of waste effluent at all times.

We thought we were, but if any remedial operating techniques or facilities are needed, we will do.

A third recommendation: Eslava Creek plant - expansion of plant capacity and effective disinfection of waste effluent at all times. The Water and Sewer Board recognizes the need for action at this plant and expects to have completed remedial measures prior to the date of February 15, 1973, hopefully **well ahead**. This particular problem is being given careful study because of the difficulty of arriving at a solution in which the best technological answer and the best financial answer are brought together for the best overall answer. Briefly, the feasibility and economics of rerouting the sewers in large areas of the city are involved; the study of routing to other plants is involved; the study of tertiary treatment at this plant is involved; the study must carefully consider satisfying the emerging new criteria so that when accomplished the solution will meet these most modern standards.

Also involved in the whole consideration is money with which to do the job. It appears certain at this point that a raise in rates will be a necessity. The emerging new criteria of treatment will have effect on what this raise will be.

We were interested in the accounts from the pollution hearing in Pensacola which seemed to bring out that water bills of the past of from $2.50 to $4.50 per month will not do the job and would have to approach those of gas and electricity if we are to have clean water. The figure of $30 per month was mentioned. We do not anticipate anything like that, but it will be substantially above the present average of $7.68.

We believe that laying the cards on the table is good and that you gentlemen in high positions perform a real public service when you tell the general public that cleanup is expensive and that they as individuals pay the bill. I hope that you will continue to bring out this point because we people on the local level need all the help we can get to explain the rising costs to our customers. The big cost is not for clean water but for cleanup of the soiled water after it has been used and becomes waste.

This city and community have never shirked their responsibilities so you may be assured of their cooperation now.

We have put together a few slides which give a quick view of the tremendous job accomplished. I think that you will enjoy them and be impressed.

MR. CROCKETT: Mr. Stalcup, I believe Mr. Terrell who will follow you will present these slides. Am I correct?

MR. STALCUP: Yes. May I make one little addition?

MR. STEIN: Surely.

MR. STALCUP: I would request that the next time they sample our effluent that they give the chlorine a chance to do its job.

MR. STEIN: Yes. You know, I almost asked a question on that when they raised it, and I didn't pursue that. I didn't know whether it was lack of detention time or what the story was, but I can appreciate that.

One thing I think, Mr. Stalcup, in looking at the record of Mobile and dealing with the port cities in the country Mobile can be proud that you have moved ahead as rapidly and have possibly as complete a treatment as any of the port cities. You have got to recognize you are not on a lake, you are not in an island city, and I put you with the port cities and I think Mobile has done an excellent job. I think the reason that you have maintained as many of the oyster beds as you have had open in Mobile with these open areas and these temporarily open areas has only been due to the tremendous sewering job and treatment job and the foresight that the city of Mobile has had.

In other areas we have had some dismal records since 1948, and I think you people in the shellfish industry know that, bed after bed after bed has been closed and the encroachment has been coming on year after year.

J. A. Stalcup

I think Mr. Stalcup's approach as to how he wants to cope with the problem of recognition of who is going to pay for this and the ability to put this frankly before the voters and the people is to be commended. I have talked about that telephone bill and I think the contrast was that you are not going to ask them to pay nearly as much for clean water. The contrast here is that if we look at what we pay for telephone or electricity or to maintain a car on a monthly basis, you are not going to nearly approach this with the water bill.

And also I would like to indicate that despite these figures that we are faced with here that Mr. Stalcup gave, if you look at this you are really getting a bargain, because if you figure what you paid in 1948 for a suit or an automobile and what you are paying for it now and if you are looking at what the water costs are, they haven't gone up too much. Again, you are to be commended. If you are talking in 1948 of average costs of water services of $2.90 a month, and that was just water in 1948 and you have not had a sewage treatment for that money, you can perhaps double it and you can make it over $5 a month if you are going to have sewage treatment. But in 1969 it was only $7.69, and I think that is about as modest a price increase as I have heard of over that time period for any kind of service. I think the city is to be commended for keeping the prices as low as you have.

So we look forward, with a base such as this and a cooperative statement on this from the city of Mobile, to really being able to work out an effective program.

Thank you very much for your statement.

MR. WHITE: Mr. Stein, I would just like to add a point of commendation here, because I am well aware of other major port cities in the Southeast Region; and I will say that none has measured up to what Mobile has accomplished.

MR. STALCUP: Thank you. I appreciate those words coming from you gentlemen.

MR. STEIN: Right. By the way, I say this is more than southeast, this is port cities in the country, that Mobile stands right in the forefront. And that is no mean accomplishment.

Thank you very much.

T. J. Terrell

MR. CROCKETT: Mr. Tom Terrell, representing J. B. Converse & Company, Consulting Engineers, Mobile, Alabama.

THOMAS J. TERRELL, PROJECT MANAGER
J. B. CONVERSE COMPANY
MOBILE, ALABAMA

MR. TERRELL: Mr. Chairman, Mr. White, Mr. Crockett. I am going to present a series of slides Mr. Stalcup referred to which depict the progress of Mobile from the late 1940's up to date in the field of pollution control. Some of these slides were shown in 1967 at an earlier pollution control meeting and they have just been brought up to date.

(The following commentary accompanied the showing of the slides.)

This is a map of the Mobile metropolitan area showing the location of the various treatment facilities in the area. Beginning at the bottom of the map is the Dog River plant, also known as the Bill Ziebach plant, we have the Halls Mill, Eslava, McDuffie, Threemile, Grover, Eightmile and Chickasaw. All of these plants are secondary treatment except for Chickasaw,which is a lagoon and of course secondary also.

This is a general map of the metropolitan area. The red color is depicting the condition that existed prior to 1948 in which there were no treatment facilities available.

The first plant that was constructed was the Threemile Creek plant, which provided treatment of the wastes from the area shown in green on this map.

This is an air view of the Threemile Creek treatment plant.

This is one of the filters that is over 200 feet in diameter.

This is the operator collecting a sample, which is done on a day-to-day basis.

In 1950 the Eslava Creek plant was constructed, which took another large area of the city and provided treatment facilities.

This is the Eslava Creek plant, which is located on Interstate 10 out in the western part of town.

This is just a general view of the plant showing the filters and the clarifiers.

This is a digester at that particular plant.

In 1954 the Grover Street plant was constructed for the city of Prichard. At that time it was a primary plant. It has now been expanded in 1968 to provide secondary treatment.

This is a view of that particular plant.

This is one of the operators collecting samples from the final effluent.

And this a picture of the sample. I think you can see that it is quite clear.

The sample is taken into the laboratory and they are run in color in this view.

In 1956 the McDuffie Island plant was completed, which serves all of the downtown of the older section of the city.

This is an activated sludge plant located on McDuffie Island.

This is a laboratory on McDuffie Island. The gentleman with the striped shirt is a graduate chemist, full-time employee of the Board, to monitor all of the treatment plants throughout the area.

Up in the top of the picture in 1961 was the

Eightmile plant constructed for the city of Prichard.

This is a view of that particular plant in July 1965 out north of town.

This is just a general view of the plant.

(Another general view of the plant was shown here.)

In 1962 in the south part of town in the lower left-hand was a Halls Mill Creek plant. You can see here that almost all of the city is now receiving treatment.

This is a view of that particular plant.

All of the plants in the area have laboratories. Most of the laboratory work is done at the McDuffie Island plant, but there is some laboratory work done at the individual plants.

This is one of the digesters at Halls Mill.

In 1963, up in the upper right-hand corner, the city of Chickasaw constructed a lagoon to replace a primary facility that had been constructed back during World War II.

This is a lagoon located on Chickasaw Creek, which is in the lower right-hand corner of your picture.

This is a low angle view showing the clarity of the water.

In 1966, in the lower right-hand corner, the Dog River plant was completed to provide treatment of the wastes from the area down out of Brookley Field.

This plant provides secondary treatment and is discharged into Mobile Bay.

All of the treatment facilities in the treatment plants provide chlorine disinfection and this is one of the chlorine cylinders that handle it at the Dog River.

Another view of that particular plant.

This is a view of the sludge bed at Dog River.

This indicates that all of the area within metropolitan Mobile is receiving treatment by 1970. In this particular one the area along the State docks and downtown Mobile is being given treatment or provisions have been made for treatment in 1970.

This is a new tunnel construction, one of the things that has held up the construction of sewers in the downtown waterfront area. Until this particular project got through its planning stage and the urban renewal work could be completed this sewer system was impractical, but is now under way.

This is an actual construction scene on the sewer system along the waterfront.

In fact, all of the next two or three pictures show the actual construction in progress.

As pointed out in Mr. Feaster's report, study is being made for the removal of wastes at the Alabama State Docks. This is a view showing the entire State Docks area. This study is to be completed within the next six months.

One of the primary sources of wastes from the State Docks is the Administration Building shown in this particular view.

This is one of the small toilet facilities located along the wharf. There are a number of these things throughout the area.

This is the outlimit drydocks over on the eastern side of the river. A study is also being conducted and this study is expected to be completed within the next six months.

(Another slide was shown here without a comment.)

This chart is an audit of the Water and Sewer Board for the city of Mobile. It shows that from 1958 to 1968 the Water and Sewer Board had spent approximately 40 million dollars in the collection and treatment of sewage. In addition to this 40 million dollars spent by the Board of Water and Sewer Commissioners there has been approximately $10 million spent by the other municipalities in the area.

Thank you, gentlemen.

MR. STEIN: Thank you.

Are there any comments or questions?

Thank you for a very excellent presentation. I think this just emphasizes what Mr. Stalcup had indicated, that Mobile has a very active program.

Mr. Crockett.

MR. CROCKETT: Mr. John Ray Nelson. Is Mr. Nelson in the audience yet? Mr. Nelson had asked to appear at 11 o'clock this morning, so he should be here in a few minutes.

Mr. D. M. Graham, President, Seafood Haven, Inc., Bayou La Batre. Is Mr. Graham in the audience?

MR. GRAHAM: Mr. Stein. I am Dayton Graham from Seafood Haven, Inc. We have listened to most of the meeting so far and realize that most of the information has been taken up. We would like to relinquish our position of speaking at this time.

MR. STEIN: You are the most popular speaker we have had so far. (Laughter.)

Thank you.

Mr. Crockett.

MR. CROCKETT: I would like to comment that Mr. Graham and his company have been most cooperative among the seafood industries in the Bayou La Batre area in seeking solutions to the problems of waste treatment and disposal.

Has Mr. Nelson entered?

Mr. Ben Kilborn?

MR. KILBORN: Mr. Crockett, I would like to follow Mr. Allen, if I may.

MR. CROCKETT: You reminded me of that yesterday and I had forgotten it.

Mr. George Allen, President, Mobile County Wildlife Association.

GEORGE W. ALLEN, PRESIDENT
MOBILE COUNTY WILDLIFE AND CONSERVATION ASSOCIATION, MOBILE, ALABAMA

MR. ALLEN: I don't speak with a southern accent. I am not going to quit before I start, so as usual I am going across the grain of just about everything else.

My name is George Allen and I am here today representing the Mobile County Wildlife and Conservation Association, of which I am President at this present time.

The purpose of the Association in being represented here today is to offer to the group here assembled the thoughts of over 1,500 individuals who are interested in the perpetuation of our natural resources, the wise use of the resources and the effects of these resources on the persons involved. The thoughts of this group concerning the problems of pollution are well known throughout this State and represent the interests of commercial fishermen, sportsmen, oystermen, seafood processors and the interests of all who feel that our natural heritage is not to be frittered away for the benefit of a relatively few individuals and their economic benefits.

This group recognizes the rights of every individual, both corporate and private, to the use of our water. We do, however, resent the use of this water in any manner that will impair its considered value by any other member of the community. This resentment has been felt in our State capitol, where we have been most active in developing a reasonable set of water standards. We are proud of our efforts and feel that they have been in the direction of proper and sound water management.

Because of the specific nature of this hearing, that of the economic loss to the oyster industry due to pollution affecting shellfish harvesting in Mobile Bay, we will confine our remarks to this specific problem. Due to limitation of time, and the fact that the mind can absorb only what the rear end can endure, we will not go into the problems of our freshwater pollution which could take all day just to enumerate.

First, let it be understood that every effort and statement made in this presentation is not to point the finger of accusation at anyone. The report of the

FWPCA speaks for itself, and it is not believed that this is the time or the place to enter into a debate of "who done it," or what should the restitution be. As the late John Kennedy said, "Let us go forth together."

Secondly, let it be understood that no one in their right mind can say that any action taken by the State Health Department in the closure of the oyster beds was not done for the welfare of the oyster consumers throughout this country, and our oysters go throughout the country. If this agency should err, thank heavens it was in the direction of safety and not calculated risk. One case of hepatitis that could be pinned to the coattails of the Alabama oyster industry would have done more damage to the oyster industry than six weeks of unnecessary closure. We have all seen what has happened to the industry when it is publicly announced that a State's oysters were polluted and caused the death of some child in St. Louis or Denver. We might as well close up shop for the rest of the year and perhaps even the next season as well.

Prior to my present employment I was the Chief of the Alabama Seafoods Division for the Department of

Conservation. In this position I was in an excellent observation post to see what extensive closure of the reefs could do to the economy of this industry. The only fault of the FWPCA report is that it underestimated the economic impact of closure on the entire area. Not only did the oysterman suffer, but the packers, the shippers, the truck lines, the stores of the area, the associated industries of boat building, machine repair and equipment manufacturing came to a standstill.

On New Year's Day 1961 it was our painful duty to tell the oystermen, "Happy New Year, your oyster beds are closed." By the middle of February there were children going to school half clothed, half fed, and the rest of the family was in worse shape than this. Stores closed and associated enterprises were desperate. The county even filed for disaster relief from the government. The reefs remained closed for the balance of the season and the oyster industry suffered a blow that took years to recover from. In the process, families had moved from the area to look for work in other areas. Names that had long been associated with the oyster industry were no longer seen on the lists of active participants. This loss of the human resource to the oyster industry has never been redeveloped. Why should it have been? There is no incentive for an intelligent individual to expose his family to such an on-again-off-again existence if there is any other way to make a living. So many of the skilled oystermen left, never to return, and I for one could not blame them.

This is the true picture of what long and indefinite closures have meant to the oyster industry. It is not a picture of increased growth of our community in the fields of urban and industrial population and progress. If it is such a picture, it must be painted as a child's finger painting with instructions that read, "I am pollution, color me black."

If this group would desire still more verification of this condition, they should come with me for two hours. I would be able to take them through small communities where once there were prospering oyster houses, busy people and a healthy industry. Now they can see abandoned homes, fallen down shops and rotting oyster boats.

It is true that pollution was not the only factor involved in the industrial degradation. We are faced with a situation where other small enterprises have fallen by the wayside because of higher wage demands, mechanization of industry and other so-called advances. But the oyster industry is somewhat different. Oysters must still be opened by hand and as yet no satisfactory substitute has been found for the knife, bench and bucket. The discouraging part of this situation is that the one factor that could have been controlled by our efforts was not controlled. This was the factor that broke the camel's back, and that factor was uncontrolled pollution.

I suppose the correct observation to make at this time is that this is in the past, we must develop the present to insure a future. This may well be, but what does a realistic look into the future show?

Well, in the first place, if Mobile grows to 350,000 people, as was stated yesterday, what does this mean in domestic waste treatment?

Mr. Chairman, could I ask Mr. McClure to read this, please?

MR. STEIN: Certainly.

Go ahead, Mr. McClure.

MR. MC CLURE: Well, in the first place, if Mobile grows to 350,000 people, as was stated yesterday, what does this mean in domestic waste treatment? Yesterday we spoke of 85 percent and 90 percent treatment of waste. This means but one thing and that is that tertiary treatment will have to be involved. I doubt if any community in the United States the size of Mobile, or larger, could go this route at the present time. The costs would just be too great.

If we are reasonable, and don't walk down any primrose path, we must recognize that for the time being complete secondary treatment is about all that we can expect for some time. If this is the case, we are talking about 70 percent effectiveness in our treatment. If at the present state of the art of sewage treatment we could get continued assurance of 70 percent, we would all breathe a little easier. If, however, we obtain 70 percent effectiveness, this means that in a city of 350,000 people we will have a remainder of 30 percent untreated wastes or a population number of 105,000 people dumping untreated waste into the upper portions of Mobile Bay. Now on top of this, you must add the fact, as stated yesterday by authorities more competent than I, that the surface runoff alone would make the lower reefs untenable in times of heavy rain and storms.

We have another problem that must be realistically faced. Sewage treatment plants always play a game of hounds and foxes. You can't build a sewage treatment plant until there is a need or a demand for it. To create this need or demand you must encounter problems involved in residential areas, and even industrial areas, creating a sewage or waste load greater than the existing capacity for treatment. Can you imagine the reaction that a mayor or a town council would get if they pressed for the building of a $3 million or $4 million sewage treatment plant in an area where there is nothing but pine trees and boondocks, just in case development might occur in that particular location in the undetermined future? Under the present system of municipal and industrial planning and development, sewage treatment plants and facilities will always be trying to catch up to an established demand and they will always be too many years behind this demand while we suffer under the same problem with which we are faced today.

To alleviate this problem, we must look further ahead than we are at the present time. We should not stop our present efforts and throw up our hands while we walk away from this problem. It must be faced honestly and realistically.

This problem will call for an approved plan of urban, municipal, industrial and estuarine planning in which the factors of sociological developments for all are considered. No factor of interest can be left out of such considerations. There must be a place for everything possible and we are just going to have to become adjusted to a life of regimentation and order that will appear abhorrent to most of us.

I will not dwell on the problems of urban planning, for I do not feel that I am qualified to do so. I would like to make a few statements about estuarine planning.

Our estuary is not going to get any bigger, and with this no one can disagree. In order that we go into the sensible field of multiple uses for our estuary we are going to have to consider the uses to which we will want to put our estuary. There will have to be a place for industry to develop in an orderly and progressive manner. There will have to be a place for our estuarine species to find sanctuary and follow the age-old processes of nature. We must have a place for the continued existence of our oyster industry.

This in turn will have to be divided into two segments: One for those who wish to utilize the public oyster bottoms and work within the restrictions imposed on such areas so that all of those working such areas will have an equal and fair opportunity to harvest the resource. The second segment will have to be for those who wish to invest their own money and efforts and develop their own reefs to do with as they please as long as they do not infringe on the rights of others enjoying the same privilege. While this particular recommendation will meet with resistance from some, the oyster industry will have to carry its own weight and pull its fair share of the load.

In addition to this there must always be a place for those who wish to progress and expand by their own efforts, restricted only by their individual ambition and enterprise. When this country of ours develops into a state where there is no room for the most valuable of all human commodities, that of honest sweat and ambition, I for one do not want to be around. The greatest inducement to be found in this world is the dignity of honest labor, sweat and ambition through your own efforts. When this is gone, so also is the dignity of the individual. And it was this very dignity that made this country the greatest in the world.

Such planning will not be done, or should not be done, by any bureaucratic big brother somewhere in the confines of an administrative building miles from the source of the problem. It must be done by responsible, knowledgeable people who represent the interests involved, persons with integrity, consideration, and an understanding of the problem. Such a plan should be established as the law of the coastline and should be adhered to. Impossible? Not by a long shot. There have been men in this very room the past two days who would be more than qualified for the job. Personal shortcomings would be balanced out by the law of checks and balances by the very presence of the others with equal responsibility.

There is one ingredient that will be necessary for the success of such a program and the continued existence of this oyster industry of ours: Clean water. Without it the whole estuarine complex will be worth nothing in a few short years.

MR. STEIN: Thank you very much.

Are there any comments or questions?

You know, everyone can have his view and I think you should stay with this, but I would like to just make two observations.

One, as I read the Federal report, these terms of 85 or 90 percent BOD removal are secondary treatment and not tertiary.

The next point is that if you are talking in terms of removal, 70, 80 or 90 percent, that means the organic loading. They also talk in terms of disinfection and we hope if you have that disinfection, particularly in municipal wastes, 100 percent of the bugs and the pathogens will be killed. That is the purpose of the disinfection. I don't think you can equate the material going in with just that the bugs are going to get through in the same proportion as the organics or some of the other materials, and this should be kept in mind. I think the same thing obtains for municipal wastes--the issue that the pulp and paper people have been making all the time.

But I don't think anyone here is proposing to just have a 70 percent reduction in the bugs or an 80 or a 90 percent reduction in the bugs. Everyone is talking about killing 100 percent of them.

MR. ALLEN: Mr. Stein, may I make a comment?

MR. STEIN: Yes.

MR. ALLEN: Some of us have been quite active in pollution control for some time. Every time we have a fish kill or every time we have a severe damage to our oyster reefs it is not due to what you would call the ordinary operation of a plant. If you compute the number of times on an average that we have lost our resource due to a malfunction or the turning of a wrong valve or misinformation or a list of excuses that are as long as your arm, I think if you computed all the times that were involved you would find that we were still getting about a 75 percent treatment. It seems that our resources are killed by mistakes and trying to justify by excuses. If I felt that we could get a 75 percent consistent day-after-day-after-day treatment of our sewage and other things, I for one would feel somewhat relieved.

MR. STEIN: Well, again, I think you have placed your finger on a problem. This is a key problem that we have. But I don't know that we are going to get at it with this approach. I thoroughly agree that the big problem is the malfunction of these plants. We are not going to solve it, unless we stop building these chintzy plants that have absolutely no reserve and must have everything working properly in order to operate at optimum efficiency. I pointed that out at Pensacola and other places. When you flip an electric switch in the offices,and you ladies in the homes, you expect the electricity to go on. When you pick up a telephone you expect to get a signal and to put through your call. If you don't, there are tremendous built-in customer complaints. In the sewage treatment plant we don't have this. When they fail, what happens is the oyster beds are closed and you get a fish kill and you have a biologic catastrophe. The reason you have the efficient operation, say, of the electrical system or the telephone system is the building of standby equipment and the ability to call on the spare equipment when something is down. Until we get to that stage in building waste treatment facilities, whether they be municipal or industrial, we are not going to have this. You know, they always say when you come out for the inspection that you are not facing a typical condition.

Perhaps, one area has been studied even more than Mobile and that is the Potomac River. I think I have been involved with every study on the Potomac River in one capacity or another for over the past 20 years. Never once have we gone into the Potomac River--and these don't involve industrial plants, by the way; they are all municipalities--where we found them all working. There were chambers down, clarifiers out, digesters out, and waste was being bypassed and going to the river. I think you can duplicate that in practically every metropolitan area.

And this is the point I think I pointed out right in this area. If you are going to tolerate what you call, in quotes, an industrial stream with two parts per million of oxygen, something that won't support life,and figure on just scraping by on a good day, when you have a bad day and you are operating marginally you are going to have a catastrophe. And this is what we want to prevent.

But I do not think, sir, that the kind of treatment that we are putting in here is going to get that. This is completely the other type of problem that we are working on in finding a way to do it. The only answer to that is to get enough equipment so that you have standby equipment during breakdowns, operators who know their job and will be able to do it, and a monitoring system so that if something goes awry the public will know about it right away.

MR. ALLEN: Sounds like it is going to be operated by St. Peter.

MR. STEIN: No. I don't think the telephone company is operated by St. Peter and you get a good one. Although sometimes when I dial long distance I think I hear harp sounds on the wire. (Laughter.)

Thank you, Mr. Crockett.

MR. CROCKETT: Mr. John Ray Nelson, representing the Bon Secour Fishery, Bon Secour, Alabama, as its President, and also with the Oyster Institute of North America.

JOHN RAY NELSON, PRESIDENT
BON SECOUR FISHERIES, INC.
BON SECOUR, ALABAMA

MR. NELSON: Mr. Chairman and conferees, ladies and gentlemen.

I am John Ray Nelson. I represent Bon Secour Fisheries, Bon Secour, Alabama, of which I am President and Manager, and also the Oyster Institute of North America, a trade organization of oyster growers and dealers, of which I am a Vice President.

My company has been utilizing the environment of Mobile Bay by growing and harvesting oysters since the 1890's, and I would like to thank you for this opportunity to express myself publicly as to the oyster industry in Mobile Bay and its future in the economic growth of the area and to offer the full cooperation of the Oyster Institute and of my company in whatever way we may be of assistance to any of the agencies involved in efforts toward pollution control and abatement.

The oyster industry is perhaps the oldest and has been and still is one of Alabama's most valuable industries not only in economic terms but also in its appeal to the public. There's something about the rivers, bays, and oceans that fascinates, and the various livelihoods conducted therein are of unusual interest to people from all walks of life, always good for lively discussion and producing welcome material for the news media. In a recent issue of the Montgomery Advertiser there appeared a line, "On this date 100 years ago (1869)--The famous Bon Secour Oysters, the finest in the world, are always at hand at the Arcade on Commerce Street."

Until the closing of Bon Secour Bay in the spring of 1969, the Bon Secour oyster reefs had not been threatened by pollution. Of course there was always the adverse publicity to oysters in general when the reefs in lower Mobile Bay were temporarily closed, but the news media has over the years cooperated by calling attention to the fact that all Alabama reefs were not being closed. However, on February 19, 1969, the reefs in Bon Secour Bay, both public and private, were closed to the taking of oysters. At that time, I requested the State Health Department to survey Bon Secour River and Bay to try to determine the source of this pollution. I trust this further source of pollution will be pinpointed since it will undoubtedly be a new factor to be considered in the overall scheme of pollution control. Please note that in the admirable accumulation of data as presented in "Pollution Affecting Shellfish Harvesting in Mobile Bay, Alabama" there is no mention of pollution as affecting the Bon Secour oysters, it being assumed that past performance would prevail, and, of course, the data presented was accumulated prior to the closing of Bon Secour Bay.

The economic loss to the economy of the State from the closing of 4,270 acres of oyster beds in lower Mobile Bay is reported by the compilers of this report to be from $56,700 to $227,000 annually. This seems to me a most conservative estimate. The acreage under consideration is made up primarily of wild reefs which oyster growers generally feel will produce approximately 100 barrels of oysters per acre. At the going rate to the tonger of $9 per barrel this comes to $3,843,000.

In the case of Bon Secour Bay, my guess is that we are talking about 100 acres of privately cultivated oyster beds ready for harvest at the time of the closing. These oyster beds should produce approximately 300 barrels per acre and the tongers get $14 per barrel. Since only about 20 percent of the loss can be regained by harvesting in the following year due to the excessive summer mortality rate on two- to three-year-old oysters thickly planted on a cultivated bed, the economic loss figures at $336,000. Note that this is loss to the producer before loss of sales is even contemplated.

I would like to call attention to one further facet of the economics of the situation. Oystering has been one of the most stable industries in that fluctuations in the general economy do not seem to affect the income of those engaged in this industry. Oyster fishermen survived the depression of the 1930's probably better than any other segment of the labor force. Many times over the years I have observed that during periods of unemployment for our native sons who have gone to seek their fortunes elsewhere, they can and do return to oystering to make a living. But we have to have our supply of oysters available--not on closed beds; the source of oysters, not the market, is the one single factor determining the economy of our industry.

When the oyster beds are closed due to pollution this hurts our image, our pocketbooks, and our ability to provide stop-gap employment at times of underemployment in other industries.

Not being a scientist, I cannot speak to your deliberations pertaining to the E. coli count to determine safe waters. Whatever is decided, I hope we will not be jumping from the frying pan into the fire. Common sense tells me that first it must be proved which bacteria is harmful and then at what level it is harmful. After that we can determine the source of the pollutant and take whatever measures necessary for control if not elimination. I hope that this is what the proposed committee can accomplish. These deliberations must be followed by action resulting in the most number of oyster beds staying productive the greatest length of time to the benefit of both producer and consumer.

Thank you. (Applause.)

MR. STEIN: Thank you, Mr. Nelson.

Any comments or questions?

If not, thank you very much, sir, for a very excellent statement.

What we are going to try to do is go through all the statements now, and we understand we have about seven more. We will recess now for 5 minutes and then resume and go right on through.

(RECESS)

MR. STEIN: Let's reconvene.

Mr. Ben Kilborn, representative of the Mobile County Wildlife and Conservation Association.

BEN KILBORN, DIRECTOR
MOBILE COUNTY WILDLIFE AND
ALABAMA WILDLIFE FEDERATION
MOBILE, ALABAMA

MR. KILBORN: Mr. Chairman, Mr. George Allen has presented the position of the Mobile County Wildlife and Conservation Association. I know we have been here a long time and I will try to be as brief as a lawyer can be, which is not very brief.

If I may identify myself, I am the past president of the Mobile County Wildlife and Conservation

Association, presently a director of that organization, director of Alabama Wildlife Federation, and a member of its pollution committee. I am also one of the five war horses they trot out at most of these hearings.

Mr. Chairman, we are most happy to see you here today because these big fellows have been beating us little fellows to death around Mobile. We realize the economic facts of life that when the president of the Southern Kraft Plant of the International Paper Company goes up to the president and asks for two or three million dollars appropriation to build treatment plants in Mobile, the president is going to say, "Well, that is nice, but they are making me build one in New Jersey and that is where we are going to build it." And so we are most happy to see that you are giving the presidents of these companies the necessary excuse for their stockholders that the Federal Government has made them or is requiring these facilities. I think that that is what we have to do, to be realistic about it, to get these jobs done, because the companies listen to stockholders, and I don't blame them for that.

One or two points, Mr. Chairman, and I don't have a prepared statement. I think one big point that has been missed at this hearing has been that there has been little or no discussion of the proposed Theodore ammunition depot channel which is going to vitally, in my humble lay opinion, affect the oyster industry and general pollution in Mobile Bay. You can't tell from this map, but generally this channel will enter Mobile and will start about where the middle bay line of the present channel is, that would be a wide 40-foot deep channel and it will go in down here approximately at Theodore. It will cross the existing waterflow that comes down this side of the bay.

Now, I think that one of our greatest problems in Mobile, and one that hasn't been emphasized and one that the Alabama Water Improvement Commission does not consider that is in its jurisdiction, is this dredge spoil disposal that has been going on from here up and down each side of the Mobile ship channel.

Mr. Chairman, it may not make the water dirty, but as a practical proposition it is filling up the sides of the bay where you can't get through there even in a small sailboat.It is dry land when we have these in

August, very shallow water the other times of the year, and certainly that shallow water impedes the flow, the flow which tends to cleanse any river or any bay. And we hope that this conference will seriously consider and recognize that there is going to have to be something done about the future dredge spoil disposal problem in Mobile and most importantly the dredge spoil disposal in Polecat Bay, which was one of our largest estuarine bays and which lies approximately parallel to the Mobile River.

A few years ago, the problem you get into, the engineers required the State to provide the spoil easement. The State hasn't got any money, so the State looks around for the closest cheapest way, and you know who goes under those circumstances--it is the shrimper, the sportsman, the duck hunter. That old marsh out there is not worth anything, let's maintain the ship channel; and certainly we have to maintain the ship channel.

But the point is, this thing is dredged and maintained every year, as engineers have stated, and will be from now on. When the Theodore ammunition ship channel is dredged it will have to be maintained, that channel which apparently is important to the industrial development of Mobile. That channel is going to drastically affect the flow of silt from the channel, and you just can't ignore it; it can't be swept under the rug.

I was interested in Colonel Sontag's, I believe his name was, statement. And I would refer, Mr. Chairman--this is the only copy I have of the full map, I paid $3 for it, I hate to introduce it in evidence but I will be happy to do so if it will be of any help to this conference--to the interim survey of Mobile Harbor Alabama Theodore ship channel, which includes the objections made to this--or points out, not objections so much, but points out that if we are going to live and live together we have to do some very detailed important planning of how we dredge this channel, how we dispose of this spoil in the future. And I will part with it.

But I would like to point out there that your own Department of Fish and Wildlife Services stated in one of the exhibits, under date of May 23, 1968, to the district engineer--I believe the Colonel said that dredging doesn't do anything on pollution or this will not have any effect on the oysters. On page 2 of that letter, which I will also introduce in evidence, concerning the Theodore channel, he said:

"The initial construction of the proposed improvement will involve the removal of about 19 million cubic yards of material from Mobile Bay and about 10 million from the land cut channel. Future maintenance of the project will involve removal of about 1,800,000 cubic yards of material from the bay portion of the channel and about 450,000 cubic yards from the land cut annually. Initial excavation and subsequent maintenance will be accomplished by pipeline dredge. Current plans are for placement of all material resulting from initial construction in diked spoil areas along the shore and in the industrial park. Maintenance spoil from the bay channel will be placed in Mobile Bay about 2,000 feet south of the proposed channel, and maintenance spoil from the land cut will be placed on land areas."

And he speaks of the effect of this later on of just dredging the channel. This channel here, the Alabama Department of Conservation recently estimated that the area that the channel will cross contains 12,000 barrels of live oysters. And then further on in the letter he says:

"Placement of construction spoil on the proposed spoils"--no, I withdraw that. He says:

"Channel dredging will cause turbid water, and subsequent siltation will affect oyster bottoms. Agreements should be reached with the Alabama Department of Conservation regarding the safe removal of live oysters before undertaking actual dredging."

So, Mr. Chairman, I would just like to point out for your serious consideration that before any channel is planned that it be done only in consultation with the officials of the Seafood Division and the other divisions of the Department of Conservation, because that apparently is going to greatly adversely affected, directly and indirectly, oyster production in Mobile Bay.

Now, the second thing I would like to point out to you, Mr. Chairman, is this. I think I am correct, and I am sure my friend Joe Crockett will correct me if I am wrong, that I believe that the low waters of Mobile River contain or have applied to them the lowest standards applied to any waters in the entire State of Alabama.

There may be one or two other dumping streams upstate, but as far as I am informed the water quality standards established for Mobile River provide from the mouth of the Spanish River to the mouth of Mobile Bay you will have this industrial and agricultural water supply, for which the standards,as has been pointed out, have been established at an average of 2 parts per million, among other things.

And I question when you are going to require these things. You are running headfirst into the water quality standards, which have been fought vigorously by the wildlife and conservation forces in this State, and I would refer you, Mr. Chairman, to the transcript several feet high of the water quality hearings held in Mobile where the conservationists set forth their position on this matter and in which Mr. George Allen presented a detailed paper. Mr. George Allen, the gentleman who just recently spoke for Mobile County, if I may mention, who was 10 years chief of the Seafoods Division of the Department of Conservation, knows what he is talking about, is well qualified. That hearing presented our position of what we thought ought to be required and we suggested a separate water quality classification for shellfish and oysters, which was not adopted.

I point out and I would like to correct the record. Dr. Ira Myers yesterday, and you had this problem, said that the permit issued to Scott Paper Company allows them to dump but they couldn't go below 2 parts per million. Mr. Archie Hooper of the Department of Conservation said it was his understanding that the permit allowed dumping only with an average of 2 parts per million, pointing out that fish don't live on averages.

And I will read from paragraph 2, which I will introduce in evidence, of the permit issued to the Scott Paper Company under date of November 2, 1962, by the State of Alabama Water Improvement Commission, and which says in paragraph 2:

"During periods of low flow, high water temperatures, or at other times when necessary to maintain a dissolved oxygen concentration averaging at least 2 parts per million..."

And I would like to know, Mr. Chairman, if we can ascertain from Mr. Joe Crockett:

No. 1, are we still working on averages in Mobile Bay, I mean in Mobile River, that 2 parts business?

If we are, when do the water quality standards go in effect in this area on Mobile Bay?

And No. 3, please, Mr. Chairman, change them and upgrade them and make them better than they are, because we can't live on the averages of 2 parts and we can't live on a minimum of 2 parts.

Mr. Chairman, one other thing I would like to point out, that you spoke in reply to Mr. Allen that when you have these accidents we should have backup systems. Every time we have a fish kill, as Mr. Allen pointed out, it is the result of some mistake, some accident. These mistakes and accidents by Geigy Chemical Company cost us thousands and thousands of dollars of fish lost and aquatic damage last year. Certainly if an employee of International Paper Company made a mistake which cost ten or twelve or fifteen or twenty thousand dollars damage to the equipment of International Paper Company, he wouldn't last an hour. He would be out on his behind in the street looking for a job. And I think perhaps if we could start just dismissing some of these people who make these accidents, dismiss them from their employment for the damage they do to our natural resources, perhaps they would be a little more careful.

And further, Mr. Chairman, I would like to know--we skipped over Alabama Drydock & Shipbuilding Company; we said that they are going to install some facility. I query when. We have the Battleship Causeway that is daily being industrialized, more and more businesses going in there; we have a serious problem there we need to do something about.

And it all gets down to what really concerns me, Mr. Chairman: you are talking here today on January 28, 1970, about what is going to be done three years from today to take care of the January 1970 pollution. Mr. Chairman, I would like to know what are we going to do between now and 1973 to take care of the increased pollution that we are going to have, the new sources of pollution? I see no plan--we see these specific things that are catching us up, but when we get to 1973 we are still going to be behind. And I submit that in a vital estuarine area like Mobile, a unique area, that it is vital that we have some planning of where we are going to locate industry and who we are going to put on these rivers and what sort of water disposal are they going to be able to make. When you run into this problem you have regional planning commissions that are generally staffed by members of the Chamber of Commerce, local industries and what-not, and I think these things are planned with a view solely to economic development of the area and without regard generally, I am sorry to say, of the effect that they will have on the fish, wildlife, recreation. and other aspects.

And I have talked too long. Thank you, Mr. Chairman.

MR. STEIN: I think you have made a very valuable contribution, Mr. Kilborn.

MR. KILBORN: Thank you.

MR. STEIN: I do wish I had the time to listen to you sometime when you are not making a brief statement. (Laughter.)

Let me go to the first issue. I believe we have to lay this out. One, I alluded--talked about this yesterday--to that standard of 2 parts per million. As far as I am concerned, the 2 parts per million is just a little above nuisance and septic conditions. When you get down that low, I don't think it makes too much difference, unless you want to argue this academically, whether 2 parts per million is an average or a high point. The water is pretty bad and you can't get much of anything. If it got much lower than that and got down to zero, it would become absolutely intolerable; it would bubble and become fetid and noisome, etc. The stench would be so bad you couldn't get to it.

Now, as I understand, Alabama has proposed a 2 parts per million standard for water in an "industrial stream." We are still negotiating Alabama standards; they have not been approved. However, I do understand that the Secretary or someone in Interior, someone in Washington, has indicated approval of this portion of standards.

I will tell you now, since that time, due to reorganizations in Washington--we always get reorganizations--among the jobs that I have, in addition to the enforcement job you see here, I also have the standards job. I am going back and I am going to raise this question about standards and that 2 parts per million.

As I pointed out yesterday, I think any industrial stream is a vestige of a bygone day. I don't think the notion of dedicating your natural resources for a wasteland, or a stream to an open sewer to attract industry, appeals to people anywhere in this country--certainly not to the people in Alabama, because the Governor has asked us in in the Perdido Bay case for the cooperation and effect that we have.

We also are charged by the Congress, which represents all the people, with the statutory obligation to preserve the natural resources for the enjoyment of you people here and your children. I don't believe letting a stream go down that low is discharging our obligation, and I will say that clearly right now. I said it yesterday.

I don't know if we can reverse this. But I will tell you this, I am going back and I am going to recommend it.

MR. KILBORN: Thank you.

MR. STEIN: I am going back, and if we can't reverse it now, I am going to recommend proceedings to reverse it, because I don't think the people in

Alabama should be made to live with this; and I don't believe the people of the United States can afford the luxury of living with this.

MR. KILBORN: That would be wonderful.

MR. STEIN: The next point you raise is on the disposition of spoil. That was not covered in this report. We did have recommendations on dredging in two of these enforcement actions last week dealing with Perdido Bay and Escambia Bay. The notion there was that there should be no construction dredging until there was a master plan and some very severe restrictions on the maintenance dredging until that plan was developed. We gave them about a year in each case. We have no recommendation here. I think the conferees--and I will ask them to--will consider what they want to do about this in Executive Session.

But again I will give you my general philosophy on this, developed after we studied many other rivers in many other States. I don't believe my function is to go around working with the State people in cleaning up rivers and lakes and estuaries just to make them available to be a dump. That is not the purpose. And again, in working with the

Corps, we recognize this problem.

I can see another problem. I ask you to be sympathetic with this because you raised the question in your first point about these industries. Some of the industries concerned here have similar problems in other parts of the country. This is something that it is difficult for the people in a particular area to grasp. When you look at a company here and you feel it has a problem of pollution control that is going to cost $2 million, $3 million or $4 million to correct, you don't recognize that the problem that we are facing with that company is that they may have a half dozen serious problems throughout the country where we also have to protect the water resources, no more and no less than here. When you take the total bill, instead of $3 million or $4 million, it may run into $40 million or $50 million of expenses for what the company considers a nonproductive item.

If you are going to impose this kind of burden, there is no public aid for this, this has to come out of the private funding of the company, we don't have aids for industrial waste treatment facilities. It may affect their entire financial standing or financial projections for the next decade or two. And this is a very, very serious thing.

I am sympathetic with a lot of these companies faced with this. Because again when you have these industrial streams, what you did in a sense was lure the companies in by giving them this advantage. Now we are changing the rules, so to speak, after they are in there. When we do that in various areas for companies that have plants throughout the country, we are presenting them with a tremendous bill. And I ask you all to try to be sympathetic with us and with the companies that are making a bona fide effort to do the pollution cleanup job within their resources. This is the other side of the coin. I ask you to be a little tolerant on that.

MR. KILBORN: May I comment on that just a moment, Mr. Chairman, without taking up too much of your time?

MR. STEIN: Yes.

MR. KILBORN: It is interesting to me to note that most every industry, with the exception of Scott Paper Company, that has been cited here today made little or no effort towards cleaning up the waters locally until the grandfather exemption that they had been operating under was taken away from them in Alabama in 1966. And the cost of pollution of Mobile Bay today is falling directly on the people of this area, and it does not upset me one bit to make them pay one-tenth of one cent more for a paperback in Hong Kong, China, to clean up my Mobile Bay. That is the way I feel about it. (Applause.)

MR. STEIN: Thank you.

Any other comments or questions? If not, thank you very much, sir.

MR. WHITE: I would like to make one comment about the dredging proposal and state that the Southeast Regional office did review and comment on the Corps' plan on Theodore and recommended that a comprehensive waste abatement plan be initiated or undertaken and that spoil sites be developed which would not impede flow there. Possibly we need to follow up to see if anything has been done with regard to these recommendations, but they were transmitted to the Department of the Army at the Washington level.

MR. KILBORN: Thank you.

MR. STEIN: Thank you.

We will make this an exhibit. You can have this back. This is a United States document; I can get my hands on these and get them duplicated. I am sure they are available for examination by anyone during normal business hours at the Mobile office of the Corps of Engineers.

(The exhibit referred to is entitled "Interim Survey of MOBILE HARBOR, ALABAMA (Theodore Ship Channel)" prepared by the U. S. Army Engineer District, Mobile Corps of Engineers, Office of the District Engineer, Mobile, Alabama.)

MR. KILBORN: Mr. Chairman, one more word and I will shut up again. We would have a lot more faith and confidence in our water quality standards and in our enforcement procedures if the representatives of those industries affected by those standards did not sit on there and vote for those standards. For instance, here in Mobile Bay, Mobile River and the five mile area, a representative of Scott Paper Company voted on those standards, did not excuse himself, and those things we think we would have a lot more faith in if they did not sit on them.

MR. STEIN: You are raising a real fundamental point here. Sir, I have dealt with the Scott Paper Company for many years. I have no trouble, and I give you my philosophy, with their voting or agreeing on something. Because once they agree, they go with it. Now, again I think you are fortunate here with the industries concerned. Since you mentioned Scott Paper Company by name, there may be differences in views and there may be differences in philosophy, but once they agree to something, I have found that the word of the Scott Company is fine. As a lawyer, I know when I deal with Scott I don't have to put everything down right away by chapter and verse and dot every "i" and cross every "t". We come to an oral agreement and go back to it; and I have found they have always lived up to their agreement and I have lived up to ours.

Now, let me try to do this, because I have been trying to do this with industry and with the people here that you represent, and I recognize the feelings involved. But for goodness sakes, in dealing with something like Scott Paper Company, what we are trying to do is deal with what I consider to be effective, reasonable American citizens We are not dealing with Russians or somebody on the other side of the Iron Curtain where you have to have an arm's length negotiation. We have to work in good faith.

Unless we can achieve this, I think we are going to have a very, very difficult time in getting pollution control. And again let me say we have one more problem here. I recognize that for a long time we have been fighting for the oyster men, for the conservationists, and for the people doing the job who really were voices in the wilderness, like yours, crying for clean water. And you have been outnumbered.

However, pollution control seems to have caught on in the last several months, and I think we have to recognize that particularly the big companies are vulnerable if their names are before the public all the time. I don't want this misconstrued as giving anyone a favor, but I think that since we are dealing with these industrial giants, these industrial giants are as much entitled to due process as any poor man--not any more, not any less. But they are entitled to due process, and that is what I ask. I would no more pick and poke at an industrial giant just because everyone knows the name of the company and you can always get a headline by battling with them than to move against a poor guy who was arrested and didn't have a lawyer to defend himself. And I think we have to consider that at least we are asking to meet them halfway and see if we can cooperate with them.

MR. KILBORN: Thank you.

(The following documents were submitted for the record by Mr. Kilborn:)

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE
Peachtree-Seventh Building
Atlanta, Georgia 30323

May 23, 1968

District Engineer
U. S. Army, Corps of Engineers
Mobile, Alabama

Dear Sir:

In response to Mr. B. J. Christiansen's letter of February 12, 1968, the Bureau of Sport Fisheries and Wildlife, in cooperation with the Alabama Department of Conservation, has investigated the fish and wildlife aspects of your proposed project for navigation improvements for Mobile Harbor, Alabama. The Bureau submits this report in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.) for use in preparation of your survey report. Your survey study is authorized by resolution of the Public Works Committee of the House of Representatives, adopted June 24, 1965.

Mobile Harbor is in southwest Alabama at the mouth of Mobile River. Mobile Bay, below the river mouth, is between 8 and 20 miles wide and about 30 miles long, with average natural depths between 8 and 10 feet. The existing project provides a 40- by 400-foot channel from the gulf to the mouth of Mobile River plus associated turning basins and tide channels. The existing project includes 41.7 miles of channels.

The improvement under consideration consists of a deep draft channel from the main channel in Mobile Bay into Theodore Industrial Park (plate 1). The proposed 40- by 400-foot channel will leave the main channel about 3 miles north of Mobile Bay Light, and extend northwesterly 28,000 feet to the western shore of Mobile Bay. From this point, a 40- by 300-foot land cut channel will extend about 10,000 feet to a trapezoidal turning basin within the Theodore Industrial Park. The proposed improvement further provides for an anchorage area 400 feet wide by 1,500 feet long located adjacent to the proposed ship channel near the existing pier at the bay shore line. Channel side slopes will be 5:1 in open water and 3:1 in the land cut.

The initial construction of the proposed improvement will involve the removal of about 19,000,000 cubic yards of material from Mobile Bay and about 10,000,000 from the land cut channel. Future maintenance of the project will involve removal of about 1,800,000 cubic yards of material from the bay portion of the channel and about 450,000 cubic yards from the land cut annually. Initial excavation and subsequent maintenance will be accomplished by pipeline dredge. Current plans are for placement of all material resulting from initial construction in diked spoil areas along the shore and in the industrial park. Maintenance spoil from the bay channel will be placed in Mobile Bay about 2,000 feet south of the proposed channel, and maintenance spoil from the land cut will be placed on land areas.

Fishery resources within the project area are of moderate value. Low to moderate fishing pressure occurs seasonally for both fresh water and marine forms. Species taken include spotted sea trout, channel bass, flounder, king whiting, croaker, mullet, largemouth bass, and bluegill. Oyster bottoms are located within the proposed channel alinement in Mobile Bay. The Alabama Department of Conservation recently estimated that the area the channel will cross contains 12,000 barrels of live oysters.

In addition to the sport fishery value of the project area, Middle Fork Deer River furnishes spawning and nursery grounds for shrimp, flounder, spot, croaker, and other estuary-dependent species. The intertidal zone provides basic nutrients and some escapement, which are essential for continuous and successful recruitment. Good quality estuarine areas are in short supply in the Mobile Bay complex.

Wildlife value of the proposed spoil sites is low; forms occuring are rabbit, squirrel, quail, and raccoon. There is sporadic use of Middle Fork Deer River by waterfowl when bay waters are rough.

Wildlife habitat within the industrial park will be virtually eliminated by the spoil and subsequent industrial developments. However, this loss is considered minor and no compensatory measures are recommended.

Channel dredging will cause turbid water, and subsequent siltation will affect oyster bottoms. Agreements should be reached with the Alabama Department of Conservation regarding the safe removal of live oysters before undertaking actual dredging.

Placement of construction spoil on the proposed spoil site along the shore south of Middle Fork Deer River will result in the loss of a high quality estuarine area. This type area is being constantly reduced through dredge and fill developments. Present plans for other public works projects in the vicinity also include estuarine areas as proposed spoil sites. Recently, spoil from the Middle Fork Deer River project (dredged under Army permit) was placed on the marsh north of the river. An extensive effort should be made to eliminate the spoil site south of the proposed channel and combine it with the existing spoil area.

Based on our findings, the Bureau recommends that:

1. Dredging operations and schedules be coordinated with the Alabama Department of Conservation so that adverse effects on live oysters can be minimized;

2. The spoil site along the shore south of the proposed channel be eliminated and the existing spoil site north of the channel be enlarged as necessary for spoil depositions; and,

3. Necessary action be taken to insure that approved spoiling plans, including adequate diking, are strictly adhered to during both construction and maintenance operations.

This report has been reviewed and concurred in by the Alabama Department of Conservation and a copy of Director Kelly's letter of concurrence is attached.

We appreciate the cooperation of your staff and the opportunity to comment on the proposed plan of development. Please advise us of any changes made in project plans so that we can reevaluate the effects of the project on fish and wildlife and prepare a revised report if necessary.

Sincerely yours,

/s/ C. Edward Carlson

C. Edward Carlson
Regional Director

Attachment: Letter from State
Department of Conservation

STATE OF ALABAMA
WATER IMPROVEMENT COMMISSION
PERMIT FOR THE DISCHARGE OF WASTES

Issued to:

Scott Paper Company
Mobile, Alabama

Plans, specifications and other information for the construction and operation of waste treatment facilities for the mill of Scott Paper Company at Mobile, Alabama, having been filed with the office of the Water Improvement Commission, State Office Building, Montgomery, Alabama, in accordance with Act No. 463, State of Alabama, Regular Session, 1953, page 566; a permit is hereby issued for the operation of and discharge of wastes from treatment facilities consisting of the following: primary clarifier, aeration basin, secondary clarifier, vacuum filter for sludge removal, and equipment for adding nutrients to the flow to the aeration basin.

The purpose of said works is to provide treatment of all liquid wastes except the flow of acid bleach wastes.

The above described works are to discharge to Chickasaw Bogue Creek approximately 1,000 feet upstream from the crossing of the Loisville and Nashville Railroad.

Conditions for the discharge of wastes under this permit are:

1. The total waste flow shall not exceed 50 million gallons per day, of which approximately 10 million gallons per day of acid bleach wastes may be discharged without treatment at all times. The remaining 40 million gallons per day of waste flow must receive primary treatment at all times.

2. During periods of low flow, high water temperatures, or at other times when necessary to maintian a dissolved oxygen concentration averaging at least 2 parts per million at the ship turning basin of the Alabama State Docks, the wastes shall, after primary treatment, be given secondary treatment through the aeration basin and secondary clarifier in a manner that will satisfy Condition No. 3 of this permit.

3. At times when the complete waste treatment plant, including primary and secondary units, is in operation, the average daily discharge of B.O.D. shall not exceed 25,000 pounds, and the average daily discharge of suspended solids shall not exceed 25,000 pounds.

4. When only the primary treatment units are in operation, the average daily discharge of suspended solids shall not exceed 20,000 pounds and the average daily discharge of biochemical oxygen demand shall not exceed 40,000 pounds.

This permit to discharge as described above supersedes all other permits issued to Scott Paper Company for the discharge of wastes from the company's mill at Mobile, Alabama, and is subject to:

1. The rules and regulations of the said Water Improvement Commission now and hereafter adopted.

or

2. The provisions of Act No. 463, supra, and amendments now or hereafter adopted.

Signed:

D. G. Gill, M. D., as Chairman
Water Improvement Commission

Arthur N. Beck, as Technical Secretary
Water Improvement Commission

Issued this November 2, 1962

MR. STEIN: Thank you, sir.

Mr. Crockett.

MR. CROCKETT: A very brief comment, but in reply to Mr. Kilborn,Mr. Coil has requested me to make a comment on the conditions of the permit issued to the Scott Paper Company and the water quality standards that apply to the lower Mobile River.

The permit was issued to Scott prior to the adoption of standards. The standards take precedence over any previous action of the Commission. In other words, the minimum of 2 parts per million assigned to the lower 13 miles, I believe it is, of Mobile River will stay.

Another comment on the assignment of this classification, which happens to be agricultural and industrial water supply. This was discussed at length with representatives of the Federal Water Pollution Control Administration Regional Office at Atlanta; it went as far as that Administration office in Washington. The recognition was by all parties that with the technology that we have today for treatment of wastes being discharged in the immediate area of Mobile, and particularly the Chickasaw Creek, we could assign no greater, if I may use that word, classification to Mobile River and obtain it without causing a reduction in the productive capacity of these industries or may close them. This was the considered judgment not solely of the Water Improvement Commission but of the Federal agency involved. As Mr. Stein has said, this classification of agricultural-industrial water supply for the lower stretch of the Mobile Bay has been approved by the Secretary of the Interior.

The Water Improvement Commission agreed with the Department of the Interior that upon completion of secondary treatment facilities by those not presently providing secondary treatment for the wastes discharged within this area,the Commission, in cooperation with the Federal Water Pollution Control Administration, would review the situation and upgrade the classification if there was any possible chance to do so.

MR. STEIN: Thank you, Mr. Crockett.

Will you proceed?

MR. CROCKETT: Mr. Francis A. Becker, Director, Mobile County Wildlife and Conservation Association.

Is Mr. Becker in the audience today?

Mr. John M. Tyson, attorney and former State Senator. Mr. Tyson is speaking on behalf of Bayou La Batre, I believe.

JOHN M. TYSON
ATTORNEY
MOBILE, ALABAMA

MR. TYSON: Mr. Chairman, conferees, ladies and gentlemen.

Today I stand before you wearing about three hats. First Mayor **Wintzell** of Bayou La Batre, who is a very unusual sort of man, could not be here because he operates a one-man business. He has been the Mayor of Bayou La Batre since it was incorporated in 1954. I acted as the city attorney for a number of years. And I might say to a fellow lawyer, now being the city judge on a part-time basis, this is the first time I have never lost a case.

I also represent the Mobile County Seafood Advisory Commission. This Commission was created during the Administration of Governor George C. Wallace on the recommendation of a resolution sponsored mainly by myself to see if we could not get the seafood and oyster industry together to advise with the Conservation Department, the Water Improvement Commission, the Governor and other agencies with regard to our problems, particularly on the Mobile County side, since we apparently have more problems than they do on the Baldwin County side.

During my tenure as State Senator, we created the now University of South Alabama, which has grown into a magnificent institution of some five or six thousand students and growing every day. We boast, among other things, of having a Department of Natural Science that would have the finest biologists in the country that are ready, willing and able and have assisted many industries, assisted us in the seafood industry and others, in attacking this abhorrent problem.

Thirdly, I want to draw briefly on my experience, having represented Bayou La Batre and the seafood interests in the Legislature, in the House and in the Senate for, lo, these many years.

I would like to say that this report that has been furnished us, even though it is very shocking to the average citizen, I think it shocks those from industry, wildlife, seafood interests as well, to think of the magnitude and the vast quantities of things that are dumped into the most beautiful bay that ever existed in the world. Now, even at its lowest denominator, this report is shocking. And I think it recognizes that something must be done, something very drastic must be done.

I have been sitting here during most of the entire hearing. And I for one have been very pleasantly, not surprised, but to see that there is an overriding moral issue among those that are in industry that have to face the tremendous problem of coming up with the money to meet the problem, for those from the municipalities that know they have to meet the problem, to see that the report singles out among other communities the town of Bayou La Batre with some 3,000 souls aboard where the average income, I think, is quite low, that is trying to come forth with a sewage disposal thing to correct their own problem, to note that some million dollars has to be raised down there and it is almost impossible to come by it, but by some means we will accomplish it because we know that it is the life blood of what we do for a living.

Now, I was probably not as shocked as I would have been in reading this report had not I as a trustee of the University of South Alabama witnessed and heard an address by a gentleman who is not from Alabama. He is originally from the State of Louisiana. His name is Dr. Leslie L. Glasgow. Dr. Glasgow is a scientist, Assistant Secretary of the Interior for Fish and Wildlife, Parks and Marine Resources. He spoke at the commencement exercises June 8, 1969, in this very auditorium for the graduating class from the University of South Alabama.

If you know Dr. Glasgow, he is not the emotional type, he is not the kind to get carried away with the drama of it all, but he painted a very, very bleak picture nationwide and almost worldwide of our environmental problems. It was more shocking to me than you could quite imagine to find out the depth in which the country has plunged and all of a sudden it seems to have jelled all over the country that almost panic has set in in some areas that we must do something about this.

In his address he challenged the young person who would otherwise demonstrate and seek the avenues of venting his spleen or his energy to get into this field to help us meet this problem of our day. He pointed out something in his address, and I have a copy of the release, that directly could affect the oyster industry. I say to you, thank God for the lowly oyster, because under its shell perhaps we can find a solution to our problems before they overcome us.

The good doctor in his address departed from his prepared text to comment on several danger areas in the United States of America. Much to my surprise and on direct questioning at a luncheon following it the next day, at which some here were present, he stated that the foremost problem of pollution in the United States of America--and I am quite sure I quote him correctly--one that ranked above the problems of Lake Erie, was the Tombigbee-Mobile water. He said that the residual effects of DDT, insecticides, pesticides, industrial chemical pollutants and the other pollutants that have flowed in there have rendered this to a dangerous level. He also said that it would take some 10 years to bring it back if immediate action was taken at the date he spoke in June of 1969. He was not from this area, but he pointed to this problem of how serious things have gotten.

Now, I am sure those that have seen that it was only economically possible to dump some things in the river in the past did not realize and did not perhaps realize until this that the combination of all this could put an end to the life of Mobile Bay. The good doctor said that Mobile Bay was in serious jeopardy.

This bay was discovered, I believe, if my history serves me right, in 1519 by a Spaniard named Alonso Piñeda. The first place he set foot, as I recall, was on Dauphin Island. And what did he find there? He found a group of friendly Indians, and the Indians are still friendly. I think among the most historic things that we have in the State are the tremendous oyster shell mounds on that famous island where the Indians--the Muskogee, the Creeks, the Choctaws, the Chippewas and the rest--gathered in the summertime to feast on the most succulent oyster ever produced anywhere in this world, I suggest.

And I would think from that day forward and forevermore that we that surround this beautiful coastline will not let this bay die. We are the same type of people, we can cooperate, we can get together. We like to see the cooperation when we served with the Federal authorities along with the State authorities, and we only wish it was that way in some other departments, and perhaps we can achieve that.

All has not been exactly sweetness and light in our past dealings because of varied suspicions and small townish things against others. When Gus wrote that letter to the then Secretary, the Honorable Secretary Udall, he did it as a last resort because the poor indigents that farm those oysters had practically been put out of business and with apparently no recourse to anyone. Conferences after conferences, legislation after legislation had been attempted over the years with no appreciable success. And I can see why today, after listening to the testimony, that each person or official that was polluting the river was waiting for the next man to do something, and if he is going to do it why shouldn't I, to the point that it has gotten to this point.

All has not been sweetness and light with the composition of the Water Improvement Commission, all my dear friends. I recall one instance when I was in the Senate that I had to miss one meeting. I was a Naval Reserve pilot and I couldn't get my jet off Guantanamo Bay to get back to the Senate. And the long and pending bill that took the grandfather clause away and kept us just under the Federal standards passed without a dissent and my amendment to include some of the fisheries people and perhaps some wildlife people to balance that committee did not get off. And perhaps that was a coincidence.

I noted that John Ray Nelson said that they closed down Bon Secour. I know from my past history that over the years, and many can verify me, that this problem has been overlooked and the people in the oyster industry have not been treated fairly, because the testing procedures have improved 1,000 percent since that letter hit Secretary Udall's desk a couple of years ago. And we are getting sincere fine testing of our oyster beds and our materials.

And let me set the record straight--I wish the good doctor was still here and I am sure Joe can pass this on to him--what we of the Commission and we in Bayou

La Batre, those engaged in the oyster business, insist upon and have pressed forward for and this day want is continuous testing of those oyster beds, not every six weeks or every six months, and when those oysters are not good or polluted we don't want them on the market. We don't want some bad oysters to get on the market. We want that testing.

We have appealed from time to time to the University of Alabama, which also has a fine group of marine scientists and biologists in Bayou La Batre, to the University of South Alabama, to the shellfish laboratory, which has no jurisdiction and to the other laboratory, to get a local testing program here so we know wherein we speak and whereof we speak. We would like to see the scientists agree on what is a good oyster and a bad oyster. We would like to see, of course, that the pollution begin to abate and somebody recognize the problems of this age-old wonderful industry.

When Dr. Glasgow continued his speech, there was something else that I would respectfully like your group if possible, or direct me to the right group, to investigate this possibility. He spoke about many things and he did speak about the effects of chemical pollution on oysters. He said, and I quote:

"Chemical pollution is best exemplified by effects on mollusks and crustaceans. Changes in the proportions of the chemical constituents of sea water under certain conditions encourage the growth of an algae to an extent which interferes with the life of the mollusks."

You could go all over north Mobile Bay and you would see a green slime algae that has developed perhaps because of overfertilization, being no scientist I do not know.

He has also said very graphically that:

"Marine organisms are extremely sensitive to persistent pesticides. This is especially true for crustaceans; as little as 0.6 parts per billion in the water will kill or immobilize a shrimp population in two days."

And here is the point with relation to oysters:

"Also, a concentration of one part per DDT per million is sufficient to destroy oyster larvae." As we call them, oyster spat. "The death of adult and young oysters usually attracts the immediate attention of oystermen."

Now, we have not approached this at this hearing other than the particular kind of bacteria that is harmful to human existence. Yet I submit that the proper scientific research should be forthcoming from the University of Georgia or from the University of South Alabama and the University of Alabama,or all,or the Department of Conservation or the Water Improvement Commission or whatever to determine the effect of the chemical pollution on the oyster larvae. How can we possibly estimate the mortality rate of the oyster or the fact that those were never born once again? And this comes from a man who knows what he talks about.

"That way the public can find out what pesticides are doing. But destruction of larvae goes unnoticed. In the case of the oyster beds, we cannot put any faith in the 'old saw' about no news being good news." And this is quoting the Assistant Secretary.

There is one last point that I will make for the benefit of this speech that the good doctor made. It is not really related to the oyster in Mobile Bay.

Again it comes back to the initial point that we were looking for the safe level of bacteriological contamination of oysters. However, I think it has been evident and self-evident that millions and millions of tons over the past many years of solids and liquid wastes have been dumped into this bay and the doctor quotes it, he says:

> "Both domestic sewage and industrial waste contain substantial quantities of solids which are rapidly settled in sea water and cover the oyster bottoms."

The engineers say that they have to dredge out that sludge. How many of the bottoms are covered that when the big freshets come down are resurrected and then spread further the pollution. I would suggest that a qualified group find out the effect of this on the mortality of the oysters so that we have the complete picture.

I do know for a fact, and it is not speculation, that when the famed Chesapeake Bay and the Blue Points went down some years back that those gentlemen traveled down here, those producers, and wanted to lease bottoms in Mobile Bay, recognizing these are the finest oyster-producing bottoms anywhere, not just because I am from around here, and they estimated they could lease those bottoms, and they couldn't for various and sundry political reasons, to produce an industry capable of more than $100 million a year net profit, and that is something not to sneeze at.

I am about to close, but I do want to submit not only this speech from the Department of the Interior by Dr. Leslie Glasgow, but I also want to point out to the conferees, Mr. Chairman, a news letter that is a special edition on Regional Water and Sewer Facilities that gives a comprehensive study timetable, all of which I do not agree with, of the local municipalities, et cetera, in this area, together with the costs thereof. I would like to submit that to you for your perusal and close with a couple of recommendations.

I do hope with all that is in me that the Federal Government, through the Congress of the United States, will grant to the industries of this United States--because we love those paper companies, we love those other people, we have got to have them, they are good neighbors, they mean well, and when they are looking for many millions of dollars I don't know where they are going to find it, maybe they can--that whatever tax incentives or outright grants can be forthcoming to them in hardship cases that they will be granted. This on a State level too. The same for the underprivileged municipalities that have no money and have taxed their people beyond belief, so that they can reach in and plan ahead and meet this probably the greatest pressing problem of all time.

And I do hope that some day, so that the suspicion allays itself with the Alabama Water Improvement Commission, that we do have a balanced group with industry represented. I know industry didn't want a group from Bayou La Batre sitting on there that made us reach over and be so unreasonable, and the other didn't want to be unreasonable, but like you say, I think it is a moral issue and we that inhabit these shores will not let Mobile Bay die nor let the Gulf be polluted.

We appreciate your cooperation coming down here and we are most glad to see the cooperation between the State and Federal agency.

Thank you, sir.

MR. STEIN: Thank you, Mr. Tyson, for a very eloquent statement.

Any comments or questions?

MR. WHITE: I would like to ask just one question.

Mr. Tyson, what do you think the prospects are for the construction of a collection system and treatment plant in Bayou La Batre?

MR. TYSON: Well, the plans were complete to the point of the Federal Government giving us a grant of some $467,000 or $468,000, the total cost being in the neighborhood of $1.5 million. It appeared to the City Council, under the Mayor's guidance, that some sort of straw vote should be had because there was so much talk of the average citizen not being able to meet the requirement of the per footage assessment and pay a rather high monthly bill. The industry that is located in and out of Bayou La Batre that is cited in this report was really not adequately taken care of.

But as I said earlier, we have talked with people in Mississippi, we have talked with people that have had the brunt of Camille; we understand there are some more monies available. I believe that after this conference that we can get the local industry there to cooperate with the City Council and vice versa so that we can have this project.

You cannot imagine how unbelievable our problem is down there. We have a water table two inches below the surface, which means that our sewer system costs 16 times as much as the ordinary with the lift stations and the above ground, the pumping stations and reaching across the bayous. And you know it is one of our poorer sections, but it is also one of our finest sections.

You know, and I will close again, as Ben Kilborn said, by saying that Bayou La Batre used to be called Bayou the Battery, and it was the headquarters of Jean Laffite, and by hook or by some other means we will get us a sewerage system. (Laughter.)

(The following documents were submitted by Mr. Tyson:)

DEPARTMENT of the INTERIOR

news release

For Release Monday, June 9, 1969

REMARKS BY DR. LESLIE L. GLASGOW, ASSISTANT SECRETARY OF THE INTERIOR FOR FISH AND WILDLIFE, PARKS, AND MARINE RESOURCES, AT COMMENCEMENT EXERCISES AT THE UNIVERSITY OF SOUTH ALABAMA, MOBILE, ALABAMA, SUNDAY, JUNE 8, 1969

A COLLEGE GRADUATE'S RESPONSIBILITY TO THE ENVIRONMENT

Perhaps you heard about Comedian Bob Hope's commencement address. He had been asked to give some advice to graduates entering the non-academic world. So he told them, "Don't go."

I am more optimistic; do go! I propose a discussion of some of the ways we have mismanaged our environment. But then, from the far side of the generation gap, I want to invite you to hurry up and join us in the struggle to save our air, water, soil, and vegetation. We are all in this mess together and we need your help.

Communications media of many kinds bombard young people more continuously and effectively today than ever before, and some of the bombardment is distasteful, gloomy, or tragic in content. But although it might be reassuring to new graduates to be reminded that there still are places where peace and quiet are natural and available, and where humans can feel normal as a part of the living world, these places are disappearing.

It is not a time to be lulled, for the world is being changed, usually in ways we detest, and the quality of life in the world is changing. It will continue to deteriorate unless the educated and trained people bring their skills and knowledge to bear on protecting their world. The trick is to avoid irreversible damage to our environment; to understand consequences of our industrial development, human population growth, housing growth, and resource uses before the damage is done; to plan so that uses are compatible rather than destructive and consumptive.

In line with this need to consider long-range consequences, President Nixon's announcement of his establishment of Environmental Quality Council is an important milestone in the Nation's conservation history.

For the first time, at the highest level, we will have a means for developing and coordinating a comprehensive Federal effort to meet environmental problems. The Council will provide a method for better use of our scattered ecological programs. As matters now stand, agencies find themselves diametrically opposed in environmental concerns. My Department encourages farmers in the Dakotas to preserve potholes as habitat needed for those "duck factories." The Agriculture Department pays farmers to drain them. My Department pits itself against developers who have permission from other agencies to destroy valuable estuarine sites or alter the environment of streams beyond the ability of marine life to adapt. The President's plan will provide a high court for settling these disputes.

We who are already engaged in the environmental campaign mean to enlist all of you. From my own academic background, possibly my own bias, having preached to undergraduates as well as graduates for a number of years, I hope that by now those of you from the biological and associated disciplines are seriously concerned with ecological matters. But you graduates from other departments, this appeal is beamed at you as well as parents and friends.

The young business and management graduate bound for Wall Street should be aware that a pedestrian walking around Fun City for a day, breathes in carcinogens equivalent to two packs of cigarets. He is a prisoner of the environment, too.

I want to hasten to disclaim any favoritism in singling out New York. Other cities have also accomplished impressive pollution of their air. Depending upon one's industrial preference, you may seek out communities which will permit you to breathe -- even insist upon it -- smoke, fly-ash, dust, mist, oxides of nitrogen, sulphur dioxide, carbon monoxide, acid, aldehydes, organic acids, hydrocarbons, mercaptans, hydrogen sulfide, ammonia, solvents, and sulfides fluorides.

From my windows in a corner office in the Interior building in Washington, I can watch the jets taking off from National Airport, following the Potomac River, leaving a dark wake of unconsumed fuel as they get up, up and away. I don't know with any precision what that amount of kerosene, year after year, is going to do to the spring herring run, but it won't improve it. The jets are Johnny-come-latelys among the Potomac polluters, of course.

For that matter, air pollution is a relatively recent field of study. Not much was done about it until 1930, when the Meuse Valley in Belgium underwent an inversion. Donora, Pennsylvania, experienced its fit of strangulation in 1948. London, England, had its prolonged fog in 1952 which prevented the escape of noxious gases from the local atmosphere.

Pollution is not free. Eventually it appears on a price tag. Sooner or later someone must pay that bill. In the Meuse Valley, Donora and London, the price was sickness for a great many people, and some invalids were hastened to their graves. Pollution carries a very stiff price, and it is not at all necessarily paid by the people who cause it.

In the Appalachian Region, about 10,500 miles of streams in eight States are affected by mine drainage. About 5,700 miles of streams are continually polluted. The most significant pollutant is acid. Eighty percent of the acid mine drainage in Appalachia comes from abandoned mines, whose former owners are not going to pay the bill. Someone must, and estimates are that $3.5 million in added annual costs are imposed by acid mine drainage on industrial users, municipal water supplies, navigation and public facilities. These are readily measured costs. Our Bureau of Sport Fisheries and Wildlife estimates that when other costs are reckoned -- for destruction of aquatic life, general environmental degradation and aesthetic destruction and so on -- the annual bill may run between $16 and $20 million.

Less than two-tenths of one percent of the United States has been disturbed by surface mining, but the damage has been extensive. Surface mining occurs in every one of the 50 States. Alabama has 134,000 acres of land disturbed by mining.

About 25 percent of the acid mine pollution comes from surface mines. And strip mines are heavy silt polluters. In Kentucky a recent study found that silt pollution from strip mine soil banks amounted to 27,000 tons per square mile annually. In contrast, silt runoff from nearby land, of similar slope but forested, amounted to 25 tons per square mile per year.

Silt and soil sediments not only fill up streams and lakes, but also carry along some hitchhiking pesticidal chemicals or other substances which make the effect worse. There are rivers of pesticides running into our rivers.

The persistent, or "hard" pesticides remain in the soil for years. And they do get around, transported by flood waters or dust particles to the sea. DDT has been found in the Antarctic, where it never has been used. Like other organochlorides, DDT can build up in small amounts, gradually growing through the food chain process, to a dangerous extent in the food web.

During World War Two DDT was credited with saving millions of lives. Its success in eliminating typhus and malaria fired the imagination and we hailed it as a miracle chemical. But we have been shocked into awareness now that this great friend has some habits so intolerable we should outlaw it. We are going to have switch to chemicals that are less residual. They may complicate the task of manipulating insect populations, but they will not have the shocking ecological aftereffects of the hard chemicals.

Most of the users of DDT and other organochlorides have been and still are using them in accordance with guidelines and procedures which had been approved by the appropriate authorities.

Only recently have we awakened to the fact that these "acceptable" uses and procedures are resulting in such massive contamination of our soil, water and air.

There has been widespread publicity over the DDT buildup in Lake Michigan. The reintroduction of coho salmon caused a revolution in fishing there. Fishing in the Great Lakes had not been so great in the memory of living fishermen. The cohos, fed by banquet diets of alewives, grew to such sizes the men who caught them did not even have to lie about them. Then a few weeks ago the Food and Drug Administration seized commercially caught cohos, because they contained DDT residues greater than 5 parts per million. It was a shocking development.

Recent monitoring studies by the Bureau of Sport Fisheries and Wildlife have shown that significant amounts of organochloride compounds occur in fishes of Alabama and many waters throughout the Nation. Of 590 samples of fish collected at fifty stations, during 1967 and 1968, DDT or its metabolites were found in measurable quantities in 584 samples. Thirty eight of these or 6.5 percent contained residues greater than the FDA's interim action level of 5 parts per million in fish.

Similar findings have been found in surveys sponsored by several States. For example, 16 percent of the 257 fish samples taken in a Massachusetts study from 1965 through 1967 contained residues of DDT and its metabolites greater than 5 ppm. A less extensive study in my own State of Louisiana showed that average DDT levels above 5 ppm were common in fish taken from agricultural areas.

Miss Rachel Carson's Silent Spring was an important catalyst, perhaps the most important of all, to stimulate thinking on the total environment. Her primary target was a narrower one, but the volleys she fired at chemicals were heard over a much larger field. Although we have not yet exhausted our stock of robins, as she feared, we are awake to factors we might have ignored without her little book.

Pesticidal chemical changes are believed to cause many changes in the bodies of animals when they become stored in body fat. I have mentioned the difficulties with coho DDT readings. Persistent chemicals have also interfered with hatchability of fish spawn in that lake, and in Clear Lake, California, and Lake George, New York. A serious fish kill at the

Mississippi River Passes five years ago was traced to endrin dumped into the river many miles upstream at Memphis.

Man fouls his streams in other ways besides pesticidal pollution. For example:

Enrichment changes. Addition of fertilizing wastes from sewage plants and agricultural wastes makes a river or lake turn green, and lose oxygen at night. The City of Omaha has a normal population of about 250,000 people, but the stockyards cause a waste load on the Missouri River equivalent to 80 million people. The changes are hardly beneficial to the river.

Thermal changes. Heat from power generation plants and industrial cooling sources is raising the temperature of many streams and estuaries and a few lakes up to several degrees, enough to drive out or kill present aquatic organisms.

Industrial and household wastes. Soaps and detergents are hard on stream animals. Creamery wastes, pickle liquors from steel mills, ore tailings from mines and a hundred other types of wastes are changing aquatic environments.

The Torrey Canyon and Santa Barbara oil spills are so fresh in memory there doesn't seem to be much need to dwell on oil pollution.

The potentials for bigger spills are on the shipways now. Supertankers are under construction, and designers are planning super-supertankers, if the language can stand the strain on the superlative. The reason is so called "economy." Before the Arab-Israeli war, a 50,000-ton tanker could transport oil from the Persian Gulf to Western Europe for about $3.60 a ton, via the Suez Canal. Now a 200,000 ton tanker can take a ton of oil between the same ports, but avoiding the canal and sailing instead around the Cape of Good Hope, for about $2.40. The apparent saving is obviously one-third. But who has reckoned in the costs of spills four times as big as before?

And supertankers are on the increase. Two years ago about 10 percent of the tankers were too big to navigate the Suez Canal. Now 45 percent of the tankers are too big. According to some estimates, by 1971 almost 60 percent of the tankers in use will be too big for the canal.

Radioactive materials, like pesticides, accumulate and persist and eventually cause minute but permanent damage to tissues and organs. In recognition of this, the "safe" dosages today are one-tenth of what was rated "safe" 15 years ago. Even so, we may be harming unborn generations.

Such heavy metals as copper, mercury, zinc and lead in our wastes, and in our automobile fuel, eventually harm fish and wildlife which become exposed to them.

There is a point where Man can beat an environment to death, wound it so badly it cannot regenerate. Lake Erie, the Monongohela, the Tombigbee and the Ohio Rivers may be close to the end point now.

I have learned from President Whiddon and members of your faculty of the University's growing activity in marine biology and other marine sciences. Our Department's Bureau of Commercial Fisheries is providing some assistance to the faculty in grant-supported research on estuarine-marine subjects. Estuaries are a particular concern in daily affairs in our Department. Interior's estuarine studies are collecting information on the current situation and the resource potentials of estuaries and coastal zones. Congress requested it. The National Estuarine Inventory which results will be recorded on tape for automatic data processing. It will contain maximum available information on 864 estuaries and their adjacent coastal zones.

As you might have expected our estuaries are in trouble.

Estuaries play a dominant role in the support of a major portion of our commercially important fisheries. Approximately 65 percent of the U.S. annual commercial fish and shellfish harvest, either by volume or value, consists of species which occupy estuarine areas during some phase of their life cycle. As the typical estuary may provide a wide range of environmental conditions, many species with different life histories or environmental requirements can be accommodated simultaneously. In this respect, one cannot help but reflect that our troubled cities may have something important to learn from the clams, red drum, shad and so forth.

This harvest of estuarine fishery resources is over 3 billion pounds annually with a value of nearly $200 million to the fishermen. These estuarine fishery resources include 10 of the 15 most valuable groups of species in our commercial fisheries, such as shrimp, which support the most valuable commercial fishery; menhaden, the most important in volume; salmon, our second most valuable fishery; mollusks, the third most valuable; plus at least 70 other commercially important species.

Chemical pollution is best exemplified by effects on mollusks and crustaceans. Changes in the proportions of the chemical constituents of sea water under certain conditions encourage the growth of an algae to an extent which interferes with the life of the mollusks. This condition was reported in Shelton Bay, Washington, where red liquor, a waste product of pulp mills, was discharged in the vicinity of oyster beds.

Marine organisms are extremely sensitive to persistent pesticides. This is especially true for crustaceans; as little as 0.6 parts per billion in the water will kill or immobilize a shrimp population in two days. Also, a concentration of one part per DDT per million is sufficient to destroy oyster larvae. The death of adult and young oysters usually attracts the immediate attention of oystermen. That way the public can find out what pesticides are doing. But destruction of larvae goes unnoticed. In the case of the oyster beds, we cannot put any faith in the "old saw" about no news being good news.

Dramatic kills are highly visible, as I shall relate. But losses of both fish and shellfish to sublethal concentrations of pesticides are typified by declining populations, not publicized executions.

Physical pollution is rapidly destroying many valuable estuaries and other estuarine areas. Land fills, draining of marshes, dumping and dredging destroy natural areas which are fish and wildlife habitats. We have only scattered data, but enough to show clearly that the problem warrants immediate attention.

For example, in the Patuxent River, Maryland, deposits of sediment have accumulated to depths of 40 feet over recent (not fossilized) oyster beds.

In the northeast, 45,000 acres of tidal wetlands from Maine to Delaware were lost between 1954 and 1963.

Twenty square miles of Tampa Bay, Florida, have been filled and converted into residential areas.

The San Francisco Bay estuarine complex offers a dramatic example of what has happened in urbanized estuarine areas. Of the original 435 square miles of water area, 17 square miles have been reclaimed and 240 square miles are in immediate danger of being reclaimed. Of the original 300 square miles of marsh area surrounding this bay, 240 square miles have already been reclaimed.

Altogether, more than 2.5 million acres of estuarine habitat in the U.S. have been lost in recent years. Over one-half million acres have been destroyed in the past 20 years from dredging and filling alone.

At the present rate of attrition, the final pattern of unspoiled estuaries throughout the country not in public ownership probably will be determined over the next 5 to 10 years.

Both domestic sewage and industrial waste contain substantial quantities of solids which are rapidly settled in sea water and cover the oyster bottoms. Highly polluted harbors of the Atlantic Coast are typical examples including Jamaica Bay, New York; Bridgeport Harbor, and New Haven Harbor, Connecticut; Narragansett Bay, Boston Bay and Great Bay in New Hampshire.

Pollution detrimental to fish and wildlife is rarely a local problem. Each estuarine habitat -- a bay, marsh, or inlet -- is a link in the life cycle of important estuarine animals and plants, a nursery, or spawning area, a summering or wintering area. The population size of any given fish or wildlife species is largely dependent on the sum and quality of available habitats. When one habitat is destroyed an entire population is affected accordingly. Rarely will a pollutant affect only a single part of the environment. As the types of pollution interact so do the effects. Eliminating or reducing one link in the food chain may similarly affect some of its higher members.

Subtle, insidious, and sublethal effects that increase the mortality or reduce the reproductive potential of our valuable estuarine resources may evolve so slowly that the consequences may not be obvious until the very extinction of a species is threatened.

Mass mortality of fish and wildlife, on the other hand, occurs from sudden and deadly changes in their environment. Massive kills appear to be increasing, and a few examples suggest the magnitude and widespread occurrence of this problem. In 1963, 3,500 striped bass entering the Roanoke River on their annual spawning run died within a matter of hours from pollution. One massive single kill of 38 million fish took place in San Diego Harbor in August 1962. Approximately 3 million dead alewives drifted from the Anacostia River into the Potomac early in September 1962.

In 1963, a massive fish mortality occurred in Chesapeake Bay and its tributaries. It was estimated that more than 9 million fish died in the Potomac River alone.

In the Carolinas recent massive kill of blue crabs of yet undetermined origin has wiped out an estimated 50 percent of that population.

Obviously there are environmental dangers to fish and shellfish. But we are part of earth's population, too. Pathogenic bacteria and viruses in estuaries contain a hazard to the health of this graduating class. You are part of the interrelationship. Many acres of oyster beds are not harvested because they are in contaminated water.

In your own Mobile Bay, I am informed, precise figures are not available yet because the results from a comprehensive engineering survey will not be compiled for several weeks. But about one-third, the northern end, of Mobile Bay has been closed to oystering for 10 years because of pollution problems. The Alabama State Department of Conservation advises that this year Mobile Bay is experiencing the worst pollution in a decade. For three months, 99 percent of the Bay has been closed to oystering. And in the lower two-thirds of the Bay, about five percent of the producing reefs are permanently closed.

Another potential hazard to humans is concentration by marine organisms of industrial chemicals, pesticides, radioactive material or other poisons, at levels dangerous to humans. Mercury in some Japanese oysters has killed several people in that country, and the accumulation of zinc by oysters in some portions of Chesapeake Bay is approaching a critical level for human consumption.

Other commercial aquatic resources are affected. The large, harvestable kelp beds ringing the Palos Verdes Peninsula and Point Loma in California, deteriorated to the point where there was little or no harvesting. Studies of effluents discharged into the area did not reveal any chemical or effluent toxic enough in itself to destroy the kelp. The explanation is based on the subtle changes in the ecological balance of the kelp environment.

If I seem to have accentuated the negative it is because I think we have ample daily reminders of the great accomplishments of our technology. Of course we know we must utilize our natural resources. I am not at all sure that the public puts enough emphasis on the wise use of our resources, or their wise conservation.

Secretary of the Interior Hickel summed it up succinctly for a graduating class on the West Coast the other day. He said "your future hangs on your environment."

This vigorous, growing young institution of yours has really seen the entire history of any sort of widespread public recognition of our environmental shortcomings. Not that enough Americans recognize it yet.

Perhaps I have been preaching to the saved. As I started out to say, I am not here to convert the already converted, but to recruit you as educators of the uninformed. You are the bright, educated young people we need.

President Nixon put it this way:

"To the young people of America, I say this: It is true that you are inheriting a world you never made. But that has been true of every generation. The great, exciting difference is that you live in a world you can change.

"America needs the vision, the dissent, the constructive action your generation can provide in the years ahead."

It is fashionable today to deplore the "alienation" of the voters from those who serve them, the "frustration" of the average citizen who attempts to get something done, the "apathy" of the officeholder regarding reform. You know the current code words. Possibly you have been misled by them.

I suggest it is not very intelligent to claim that government and industry are self-propelled and self-sufficient. I mentioned what Rachel Carson did with an angry book. The individual can accomplish a goal -- and in the face of great opposition.

Recently at a town meeting in Dedham, Massachusetts, a motion under consideration called for widening a street by ten feet on each side. A resident of the street rose in opposition. He said his home had a tree, one of the few remaining at that end of the block, and he didn't want it cut down just to accommodate more trucks and cars. He wanted to preserve the grass against concrete, preserve elms and oaks against parking meters, preserve the breathing space against parking space.

Here was a bare bones defense of environmental value. And the town meeting accepted his appeal and killed the street-widening proposal by a vote of 133 to 98.

This warm little anecdote is even better than you think. The hero who saved the street was a 15-year-old boy. If a youngster not yet halfway through his teens can stand off the powerful factions who serve the automotive interests, then young men and women with college training have no right to give up before the contest begins.

We cannot rely on 15-year-olds to rectify the errors of the past and present. People who go it alone in any public competition are handicapping themselves. But citizens who coordinate their efforts can accomplish wonders and with persistence, anything.

I think that anyone with experience in a public position will affirm in the most fervent terms the power of organized interest groups. And the groups cover every spectrum of opinion. Some of them are out to get something done you do not wish done. It really is in your own selfish self-interest, the national interest aside for the moment, to see that the short-sighted spoilers don't run away with our heritage.

If you have the misconception that your opinions are not considered, I only wish I could share my mail with you. You will be read and you will be heard. The well-informed, well-educated and articulate voter swings more weight than cynics suspect. So join the crusade. There are never too many on the battlements. While you need not make a career of it, although we wish more would, at any rate do your bit.

The Nation needs your skill, whatever profession you have chosen or may decide upon in the future. But don't ever let it blind you to your permanent responsibility to the environment.

We are giving you a world admittedly burdened with flaws, and you are going to determine what happens to it. We have great faith in you. Heaven knows we wish you the very best of luck! For all our hopes are riding with you. You are going to control our descendants' fate.

XXXX

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SOUTH ALABAMA REGIONAL PLANNING COMMISSION • VOL. 1, NO. 9 • DECEMBER, 1969

REGIONAL WATER AND SEWER FACILITIES

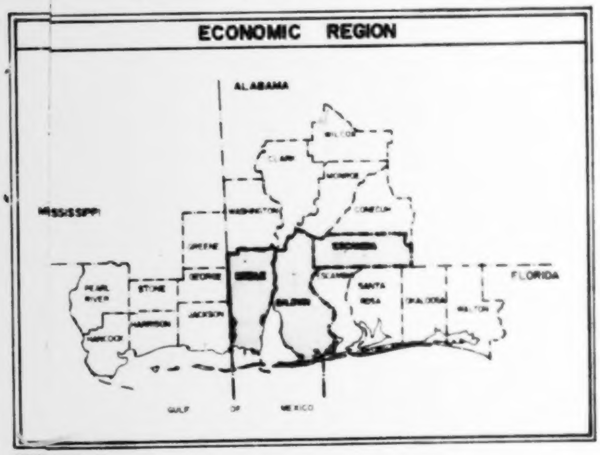
SPECIAL ISSUE—This issue is a summary of three reports prepared for the South Alabama Regional Planning Commission on water and sewer facilities in the three counties of the Region. One report is on Mobile County facilities prepared by J. B. Converse and Company and published in June, 1969. The other two are on Baldwin County and Escambia County facilities prepared by Polyengineering Company. Both of these reports should be published in January, 1970.

Introduction

Each of the studies concerns a general inventory and evaluation of the principal parts of the water and sewer systems in Baldwin, Escambia and Mobile Counties, Alabama, (Figure 1). The purpose is to assemble information on existing systems, to evaluate their general capabilities to render adequate service and, in the light of projected population increases, to estimate: 1) what major additions will be needed; 2) the approximate time at which these additions should be made; and 3) the approximate costs of these required additions.

Another purpose is to provide information that will be of assistance in planning construction in an orderly and economical fashion and to promote cooperation between the municipalities whose service areas touch or overlap.

Each study is composed of two parts: a) a written description of facilities and b) an Atlas of drawings at a scale of 1" = 2000' showing size and location of principal parts of existing and proposed water and sewer facilities, (Figure 2). The recommendations include all proposals to the year 1990 for each system separately.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BALDWIN
ESCAMBIA
SANTA ROSA
OKALOOSA
WALTON
FLORIDA
JACKSON
HARRISON
HANCOCK
GULF
OF
MEXICO

FIGURE 1

ESCAMBIA COUNTY
WATER SERVICE SYSTEM
ESCAMBIA COUNTY
SANITARY SEWER SYSTEM
BALDWIN COUNTY
WATER SERVICE SYSTEM
BALDWIN COUNTY
SANITARY SEWER SYSTEM

FIGURE 2

SUMMARY OF ESTIMATED COSTS
WATER FACILITIES BY INDIVIDUAL SYSTEMS
Construction Period and Estimated Costs

BALDWIN COUNTY

System	1969-75	1975-80	1980-85	1985-90	Total
	FISCAL YEARS				
Bay Minette	$ 1,027,410	$ 52,500	$ 73,450	$ 106,950	$ 1,260,310
Daphne	917,640	60,030	87,260	69,020	1,133,950
Elberta	316,140	121,140	40,210	20,000	497,490
Fairhope	805,500	336,060	74,570	205,400	1,421,530
Foley	1,146,180	164,700	55,910	209,490	1,576,280
Gulf Shores	1,008,130	169,620	160,600	192,580	1,530,930
Loxley	740,640	515,870	451,460	186,100	1,894,070
Robertsdale	433,720	52,340	256,050	20,000	762,110
Silverhill	367,440	279,760	6,000	10,000	663,200
Summerdale	380,450	95,110	8,000	12,000	495,560
Bon Secour	668,690	166,470	64,900	228,300	1,128,360
Bromley			318,600	10,000	328,600
Crossroads	332,810	74,560	83,700	12,000	503,070
Josephine			339,950	10,000	349,950
Lillian	318,450	26,200	55,800	12,000	412,450
Magnolia Springs	330,280	148,000	223,820	163,800	865,900
Marlow	261,800		7,000	12,000	280,800
Miflin	228,100	3,000	6,000	10,000	247,100
Mullet Point	717,800	57,000	57,500	20,000	852,300
Orange Beach	799,200	8,000	12,000	20,000	839,200
Perdido	402,920	28,500	90,000	15,000	536,420
Perdido Beach	516,960	87,380	83,010	15,000	702,350
Rabun			302,500	10,000	312,500
Spanish Fort	685,520	260,280	74,850	70,000	1,090,650
Stapleton	269,580	84,230	115,500	12,000	481,310
Stockton	605,450	102,500	152,500	20,000	880,450
Whitehouse Forks	332,490	15,390	4,000	10,000	361,880
Total Water Cost	$13,613,300	$ 2,908,640	$ 3,205,140	$ 1,681,640	$21,408,720

ESCAMBIA COUNTY

System	1969-75	1975-80	1980-85	1985-90	Total
Atmore	$ 2,279,410	$ 178,000	$ 109,000	$ 452,000	$ 3,018,410
Brewton	1,594,430	435,900	187,000	220,000	2,437,330
East Brewton	796,520	91,500	69,000	72,000	1,029,020
Flomaton	363,060	96,500	61,040	81,300	601,900
Riverview	58,810	82,000	176,000	15,000	331,810
Canoe	266,250	421,000	185,000	136,500	1,008,750
Damascus-Boykin	637,700	105,910	126,000	36,000	905,610
Freemanville	657,143	31,000	30,000	70,500	788,643
Huxford	385,120	69,410	213,220	295,760	963,510
Martinville	187,500	40,000	5,000	10,000	242,500
McCall	613,790	61,000	103,000	20,000	797,790
McCullough	319,100		5,000	8,000	332,100
Pea Ridge	34,200	2,000	2,000	5,000	43,200
Total Water Cost	$ 8,193,033	$ 1,614,220	$ 1,271,260	$ 1,422,060	$12,500,573

MOBILE COUNTY

System	1969-75	1975-80	1980-85	1985-90	Total
Mobile	$ 6,978,000	$ 4,190,000	$ 1,914,000	$ 2,921,000	$16,003,000
Prichard	778,000	285,000	184,000	281,000	1,528,000
Chickasaw					
Saraland	654,000	352,000	95,000	69,000	1,170,000
Satsuma	66,000	84,000	51,000	98,000	299,000
Mount Vernon	101,000	15,000	52,000	70,000	238,000
Citronelle	338,000	74,000	91,000	41,000	544,000
Bayou La Batre	436,000	66,000	138,000	17,000	657,000
Grand Bay	231,000	36,000	172,000	20,000	459,000
Dauphin Island	116,000	7,000	8,000	8,000	139,000
Theodore	476,000	566,000	294,000	589,000	1,924,000
Fowl River	610,000	742,000	490,000	20,000	1,862,000
Total Water Cost	$10,784,000	$ 6,417,000	$ 3,489,000	$ 4,134,000	$24,823,000

TABLE 1

Table 1 outlines water development costs for individual systems within the three counties. Table 2 outlines sewer development costs for individual systems within the three counties. The seemingly large total cost of these required additional facilities over the next 20 years appears small when broken down into five-year development periods. These costs are even more modest when reduced to per capita outlay and compared to the primary benefit to health and the secondary benefits of comfort and convenience. All costs are based on the 1969 dollar value. Appropriate adjustments will have to be made for the period of actual construction of additions. The present methods of finance which derive capital for expansion from sales, connection charges, assessments, revenue bonds, grants and private assistance will likely continue. However, the demand for an increase in both the quality and quantity of service as well as the rising costs of construction and operation will necessitate adjustment of rates from time to time.

Water Resources

Within the Planning Area, large supplies of water are available from surface and ground sources. Rivers and streams flowing through and originating within the three counties discharge over 70 billion gallons of water a day into adjacent bays. Ground water is also abundant, with well potentials in some areas having as much as 2 million gallons per day. The quality of surface and ground water is suitable for most uses in

SUMMARY OF ESTIMATED COSTS SEWER FACILITIES BY INDIVIDUAL SYSTEMS

Construction Period and Estimated Costs

BALDWIN COUNTY

	FISCAL YEARS				
System	**1969-75**	**1975-80**	**1980-85**	**1985-90**	**Total**
Bay Minette	$ 566,000	$ 204,500	$ 128,500	$ 177,000	$ 1,076,000
Daphne	1,707,900	80,000	83,000	20,000	1,890,900
Elberta			395,400	15,000	410,400
Fairhope	1,857,500	305,400	212,000	154,000	2,528,900
Foley	560,100	196,000	173,500	187,000	1,116,600
Gulf Shores	515,200	95,000	170,000	225,000	1,005,200
Loxley	647,250	104,000	70,000	20,000	841,250
Robertsdale		283,000	470,000	20,000	773,000
Silverhill			368,000	10,000	378,000
Summerdale			511,000	10,000	521,000
Spanish Fort	1,276,900	304,000	20,000	20,000	1,620,900
Stapleton	349,800	62,500	85,000	10,000	507,300
Total Sewer Cost	$ 7,480,650	$ 1,634,400	$ 2,686,400	$ 868,000	$12,669,450

ESCAMBIA COUNTY

System	1969-75	1975-80	1980-85	1985-90	Total
Atmore	$ 540,000	$ 185,000	$ 309,100	$ 201,600	$ 1,236,100
Brewton	722,960	244,000	129,000	60,000	1,155,960
East Brewton	753,100	171,000	95,000	50,000	1,069,100
Flomaton	355,500	91,000	122,000	126,400	694,900
Canoe			241,000		241,000
Pea Ridge			201,600	71,200	272,800
Total Sewer Cost	$ 2,371,960	$ 691,000	$ 1,097,700	$ 509,200	$ 4,669,860

MOBILE COUNTY

System	1969-75	1975-80	1980-85	1985-90	Total
Mobile	$ 5,051,000	$ 3,103,000	$ 4,807,000	$ 800,000	$13,761,000
Prichard	1,100,000	2,015,000	856,000	525,000	4,496,000
Chickasaw	30,000	25,000	25,000	25,000	105,000
Saraland	1,011,000	966,000	252,000	197,000	2,426,000
Satsuma	479,000	357,000	223,000	157,000	1,216,000
Mount Vernon				567,000	567,000
Citronelle	162,000	131,000	133,000	105,000	531,000
Bayou La Batre	1,713,000	248,000	76,000	213,000	2,250,000
Dauphin Island	104,000	323,000	119,000	119,000	665,000
Theodore		1,456,000	35,000	1,515,000	3,007,000
Total Sewer Cost	$ 9,650,000	$ 8,624,000	$ 6,526,000	$ 4,223,000	$29,024,000

TABLE 2

nearly all parts of the Planning Area.

It should be noted however, that the modern concept of total service in the water field involves a multi-faceted use of water resources. It requires: 1) development of a water supply; 2) treatment to the extent necessary to make the water safe for use; 3) delivery of water in amounts and at pressures sufficient to meet requirements of homes, business and, sometimes, industry; 4) maintaining pressures and volumes sufficient to combat fires; 5) collection of waste water from homes, business and, sometimes, industry; 6) routing and delivery of waste water to central points; 7) treatment of these wastes to such a degree as to render them safe; and 8) eventual disposal of the remaining liquids and solids. This is no small task and requires both short and long range planning for the best use of all water resources in the area.

Population

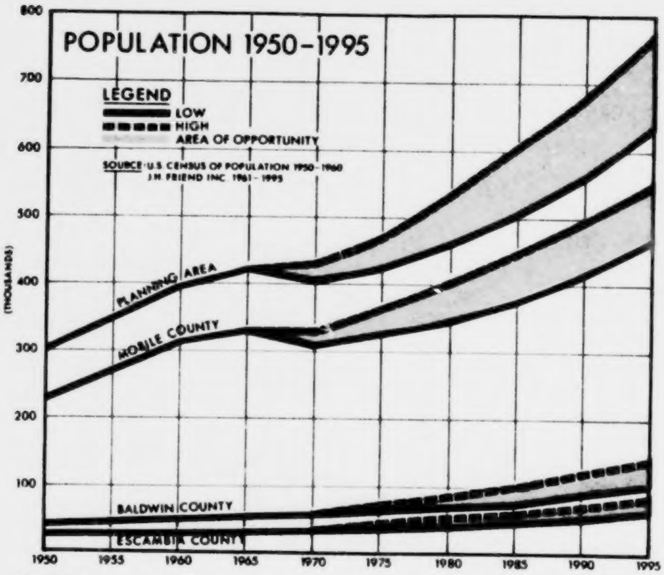
The demand for water and sewer services results directly from: a) how many people are to be served; b) when they will need service; c) where they will live and work; and d) how much water they will use. Population projections to the year 1995 for the Planning Area and for each county are illustrated in Graph 1. Medium population projections are used in Table 3 to illustrate increases in the number of occupied dwelling units in the Region. Increases in the number of occupied dwelling units together with population figures are key indicators of future required water and sewer facilities.

Figures 3 and 4 (Pages 6-7 and 8-9) illustrate the existing and probable regional configuration of water and sewer facilities to the year 1990. These figures together with the preceding tables provide estimates on the number of people to be served, when they will need the service and where they will live and work, thus facilitating the planning process. As for the amount of water used, consideration must be given to the fact that there seems to be a continuing upward trend in the amount of water that a system must deliver for each member of its population. This is due to the increasing number of appliances for personal use and to larger quantities being delivered to service industries.

Pollution

Water pollution in the Mobile area is a matter of Federal, state and local concern. Federal interest is concentrated on the status of the Tombigbee-Alabama River system as an interstate waterway and on the Alabama coastal waters, especially Mobile Bay. State and local concern is focused on the dual nature of these waters as a natural resource for the people and as a means of economic development for the Region. Area water resources supply the personal needs of the citizens and also serve as an open space and recreation facility. Economically, these same water resources cater to the manufacturing and fishing industries of the area. All of these aspects must be considered in determining water quality standards.

The main sources of pollution are domestic sewage and industrial and commercial wastes. In both of these areas some efforts have been made to control pollution. The treatment of domestic wastes to the degree necessary for protection of health conditions has been substantially accomplished. Treatment facilities are generally classified as primary, secondary or tertiary. Primary treatment is the mini-



GRAPH 1

POPULATION AND OCCUPIED DWELLING UNITS,
BY COUNTY
PLANNING AREA: 1960-95
(Medium Projection)

	Total (000)	Population In Dwelling Units Total (000)	Population In Dwelling Units Per Dwelling Unit	Occupied Dwelling Units (000)
Planning Area				
1960	399.9	392.3	3.73	105.1
1965	421.1	412.8	3.68	112.0
1970	418.9	409.8	3.63	112.8
1975	451.4	440.3	3.60	122.2
1980	498.4	485.4	3.58	135.5
1985	555.5	539.9	3.55	151.9
1990	624.0	605.2	3.53	171.3
1995	702.1	679.6	3.50	194.0
Mobile County				
1960	317.3	310.3	3.73	83.2
1965	332.3	325.0	3.68	88.3
1970	324.0	315.9	3.63	87.0
1975	345.0	335.3	3.60	93.1
1980	375.7	364.1	3.58	101.7
1985	412.4	398.4	3.55	112.2
1990	456.3	439.4	3.53	124.5
1995	507.2	486.9	3.50	139.1
Baldwin County				
1960	49.1	49.0	3.73	13.1
1965	52.9	52.4	3.68	14.2
1970	57.6	57.0	3.63	15.7
1975	65.1	64.4	3.60	17.9
1980	76.2	75.4	3.58	21.1
1985	89.6	88.7	3.55	25.0
1990	105.3	104.2	3.53	29.5
1995	121.8	120.6	3.50	34.5
Escambia County				
1960	33.5	33.0	3.77	8.8
1965	35.9	35.4	3.72	9.5
1970	37.4	36.9	3.67	10.1
1975	41.1	40.6	3.64	11.2
1980	46.5	45.9	3.62	12.7
1985	53.5	52.8	3.59	14.7
1990	62.4	61.6	3.57	17.3
1995	73.1	72.1	3.54	20.4

Sources: U. S. Bureau of the Census, 1960
John H. Friend, Inc., 1965-95

John H. Friend Incorporated

TABLE 3

mum used and does little more than remove solids. It is also the least expensive. Secondary treatment is rated more than twice as effective and twice as costly as primary treatment. It is the minimum necessary for the protection of health. Secondary treatment has become standard practice with nearly all sewage systems in the area. Tertiary treatment is the polishing of domestic effluents to such a degree that they approach drinking water in quality. The costs of construction and operation of tertiary treatment plants is high at the present time. Improvements in scientific techniques and methods of treatment will probably make tertiary treatment costs more reasonable in the future.

In the past, protection of health was the primary aim and purpose of waste treatment facilities, and health authorities agree that secondary treatment generally accomplishes this aim. In the last few years an awareness of other dimensions of the pollution problem has developed. Large segments of the public are not satisfied with the limited aim of direct health protection and desire, in addition, that those in public authority broaden the aims and goals of pollution control to include strong consideration of esthetics, conservation, fish and wildlife, seafood and, in general, the many phases of ecology.

While it is reasonable to assign high priority to the needs of the port and port-related industry, it is also reasonable to require that industry and port activity will not adversely affect their surroundings. The Federal government and the state have both adopted minimum water quality standards. However, in response to mounting public concern, regulation of water purity is likely to grow more stringent and enforcement more general in the near future. Since progress must be related to the changing demands of the times, it is not unreasonable to assume that tertiary sewage treatment will become more common in the municipalities. It is also not unreasonable to require that industry and port activity develop equally effective means of pollution abatement.

Baldwin County

People in the rural areas of Baldwin County are, with few exceptions, adequately served by existing facilities. Low population density does not warrant construction of public community water and sewer systems. Most of the urban centers are older settlements that have experienced recent expansion, especially in residential developments. Many of these towns require sewage facilities and increased water capacities. Bay Minette's sewage system is under construction. Daphne badly needs a sewage system as well as additional water storage tanks and mains. Elberta needs a new well, tank and mains. Sewage treatment facilities and improvements to the existing water system are necessary in Fairhope. Sanitary sewer extensions, a new well and water mains are required by Foley. Gulf Shores needs additional water storage facilities and extension of its water distribution system and sanitary sewer system to serve areas presently lacking service. Loxley badly needs a sanitary sewer system. The town also should have a new well, additional storage facilities and extension of its water lines. Silverhill should have a new well and also replace existing two inch water lines with lines six inches or larger to handle future development. Summerdale presently needs a new well, additional storage facilities and extension of its distribution system. Robertsdale requires another storage tank. Population estimates for the unincorporated community of Bon Secour indicate that a public water service system is justified at the present time. This would necessitate drilling a well and constructing distribution mains to serve the area's residents. Other unincorporated communities in the county that do not have water service systems may require such systems within the next five years. The Spanish Fort area has four separate water systems which should be unified for greater efficiency and broader service patterns. Figure 5 illustrates layout of existing and proposed water facilities for Daphne, Alabama. The figure is taken from the atlas of Baldwin County water and sewer systems.

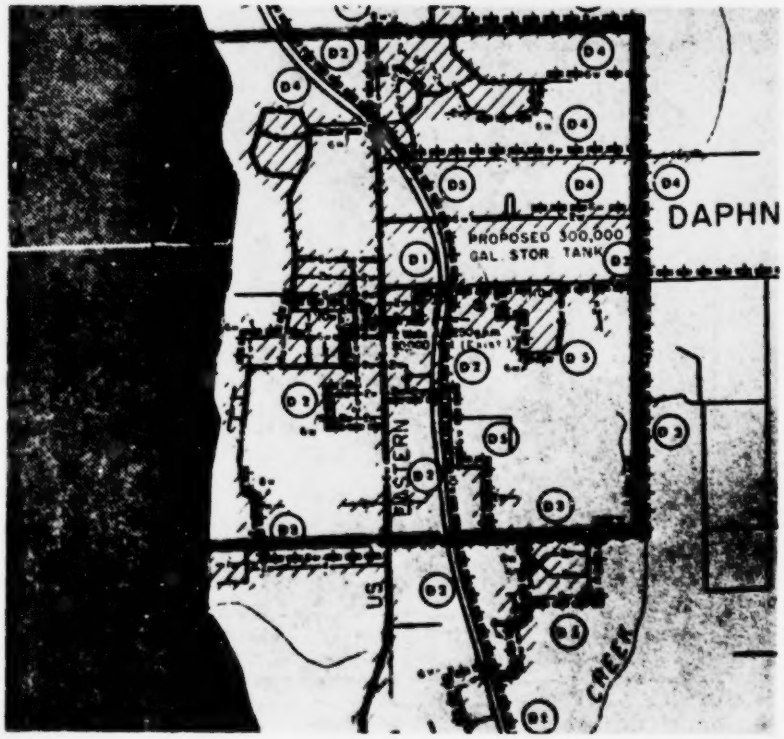
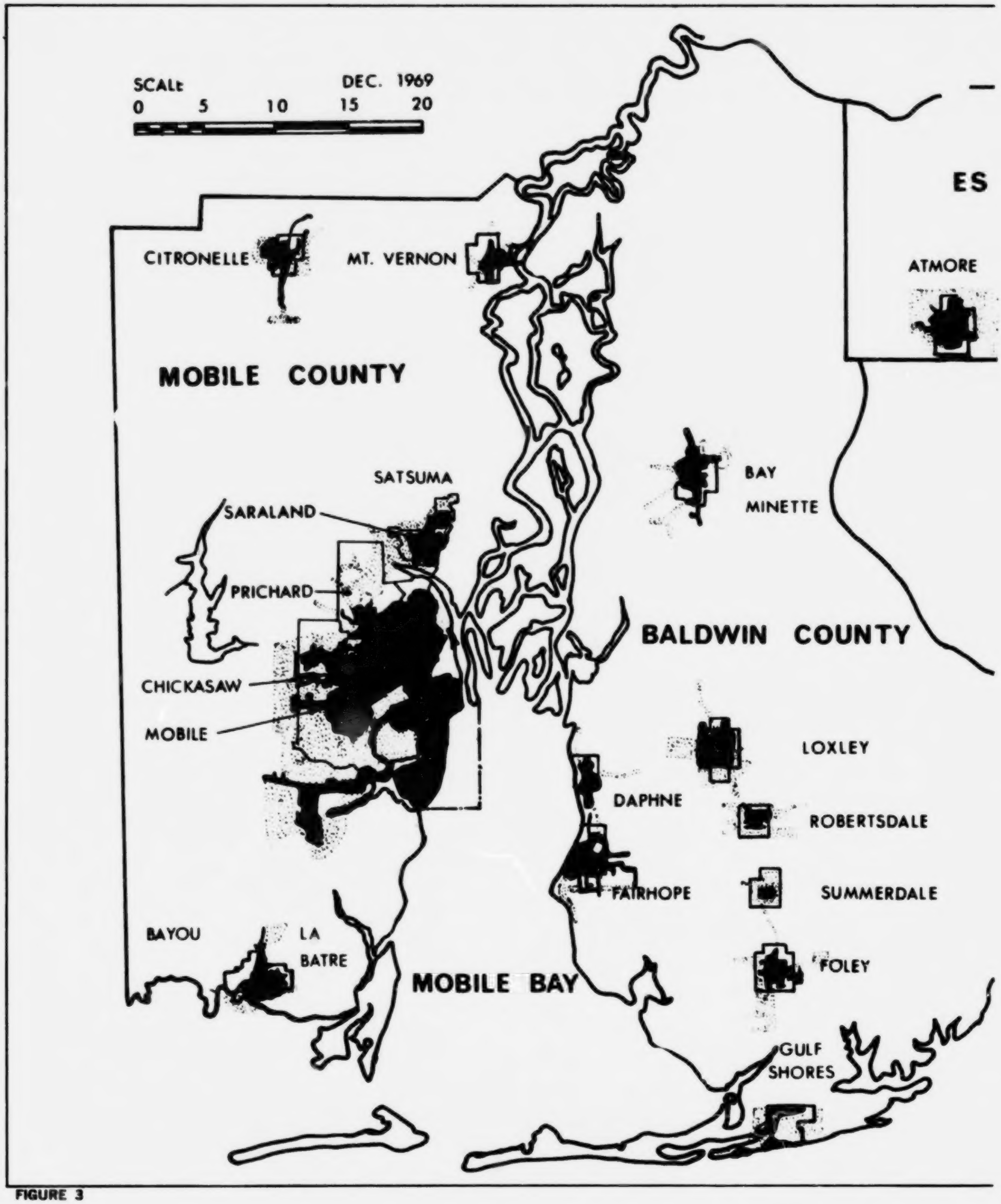


FIGURE 5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BALDWIN COUNTY
LOXLEY
DAPHNE
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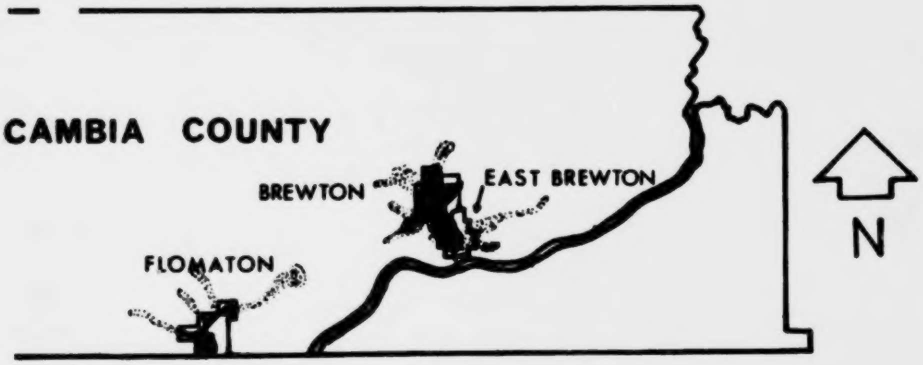
FAIRHOPE
SUMMERDALE
BAYOU
LA
BATRE
MOBILE BAY
FOLEY
GULF
SHORES

FIGURE 3


CAMBIA COUNTY
BREWTON
EAST BREWTON
FLOMATON
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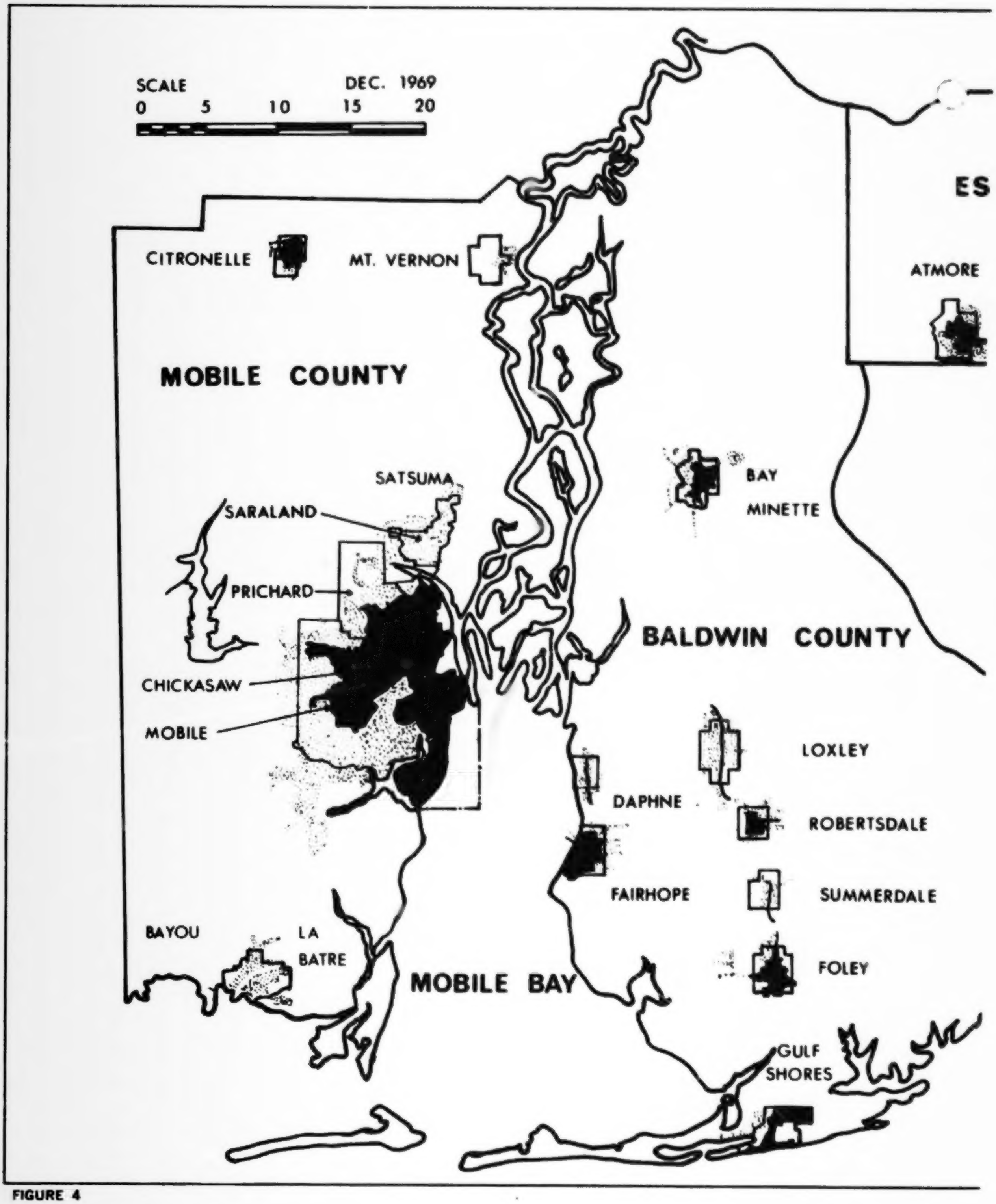
REGIONAL WATER FACILITIES

LEGEND

■ AREA PRESENTLY SERVED

░ ESTIMATED SERVICE AREA BY 1990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LOXLEY
DAPHNE
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BATRE
FOLEY
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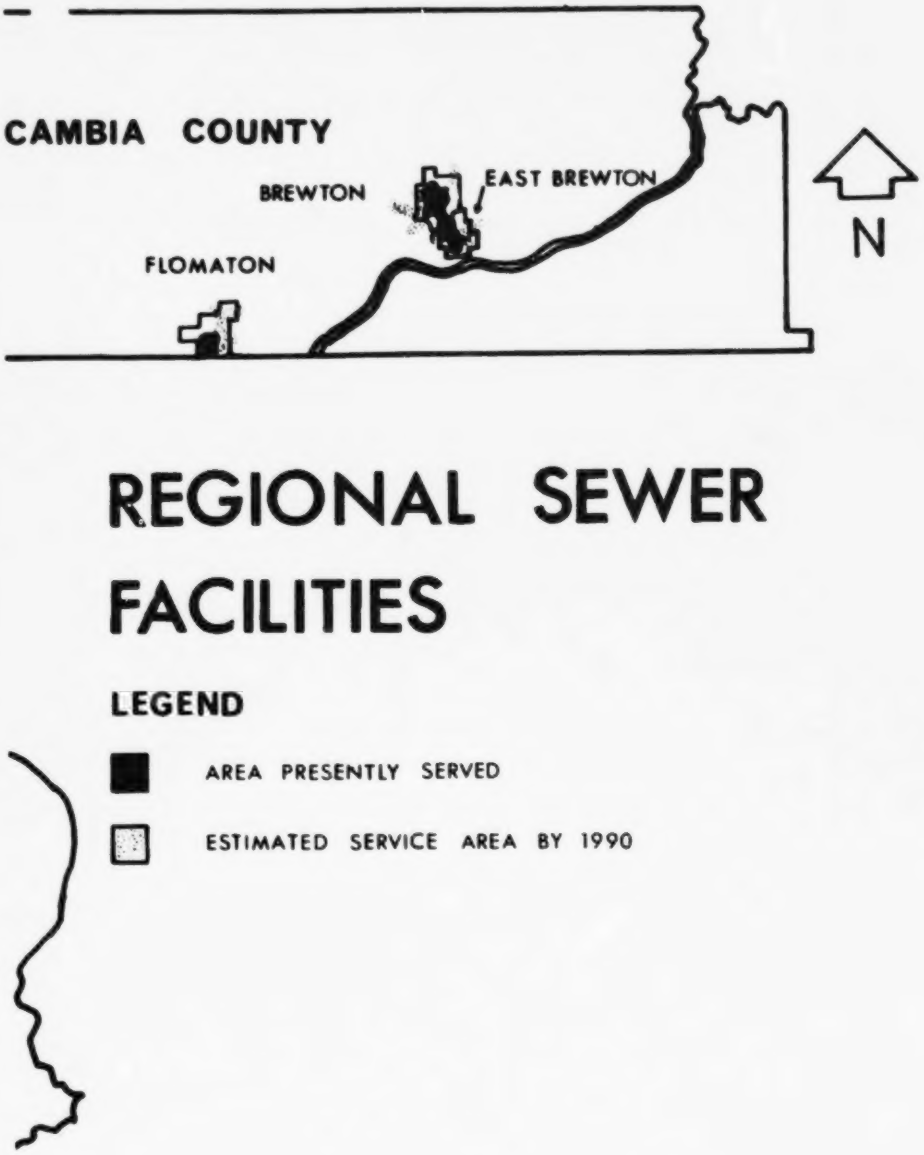
GULF
SHORES

FIGURE 4


CAMBIA COUNTY
BREWTON
EAST BREWTON
FLOMATON
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REGIONAL SEWER FACILITIES

LEGEND

■ AREA PRESENTLY SERVED

░ ESTIMATED SERVICE AREA BY 1990

Escambia County

In general, the more heavily urbanized areas of Escambia County are well served by public water and sewer facilities. Huxford and McCall have water systems under construction. The communities of Boykin, Freemanville, Martinville and McCollough do not have public water systems. The density of residential and other forms of development indicate that these communities are large enough to justify such service. Most individual homes in the outlying rural sections of the county have private wells. Insofar as it can be ascertained, the wells in service provide an ample supply of potable water. East Brewton badly needs sewage treatment facilities. At present, the East Brewton disposal system empties raw sewage into Murder Creek. This method of disposing of waste, besides increasing stream pollution, represents a health hazard to the citizens of Brewton and East Brewton since Murder Creek serves as the corporate limits of both cities. Most other sections of the county have low enough population densities and good enough soil drainage to warrant continued use of septic tanks for the time being. Figure 6 delineates existing and proposed sewer facilities for Flomaton, Alabama. This is a typical illustration from the Escambia County Atlas.

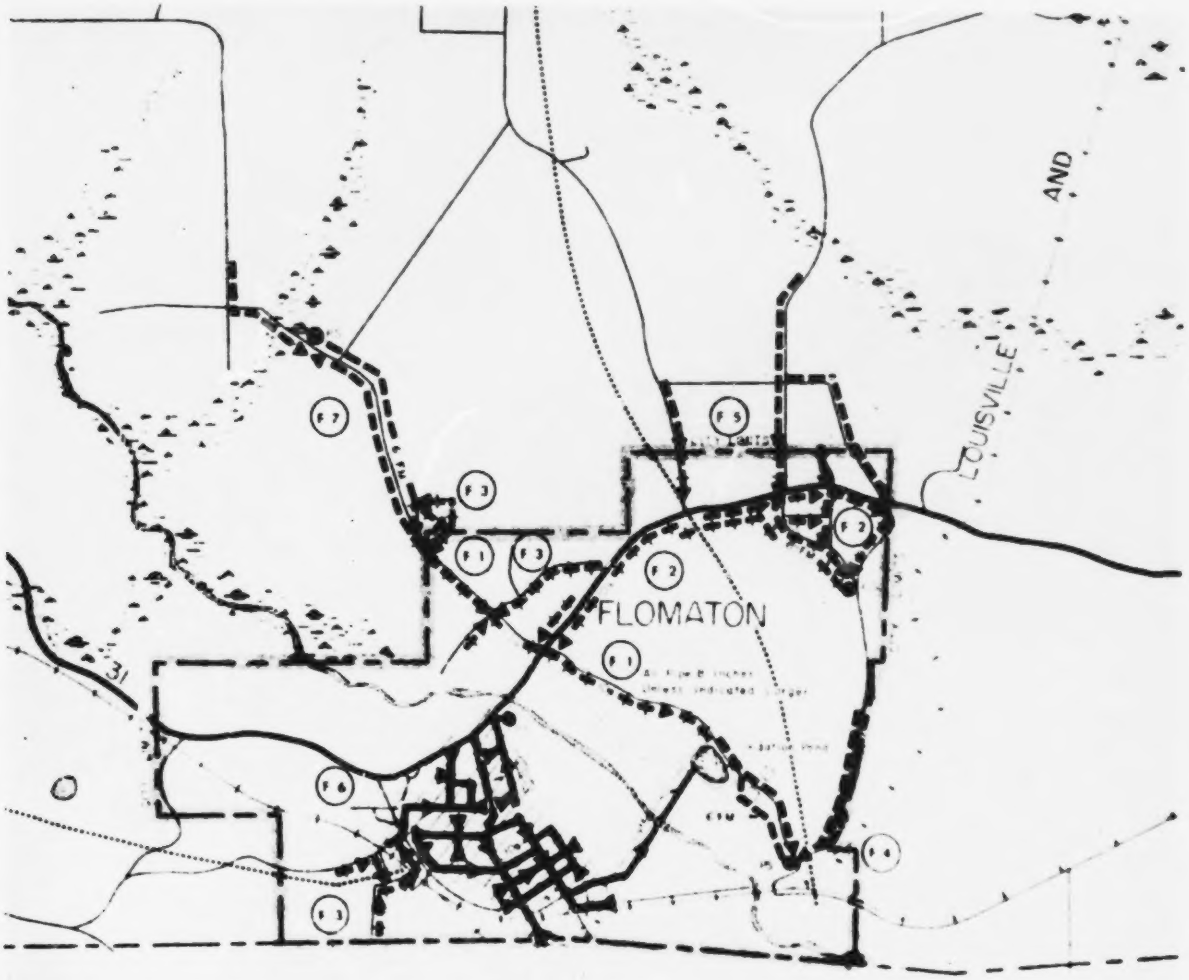
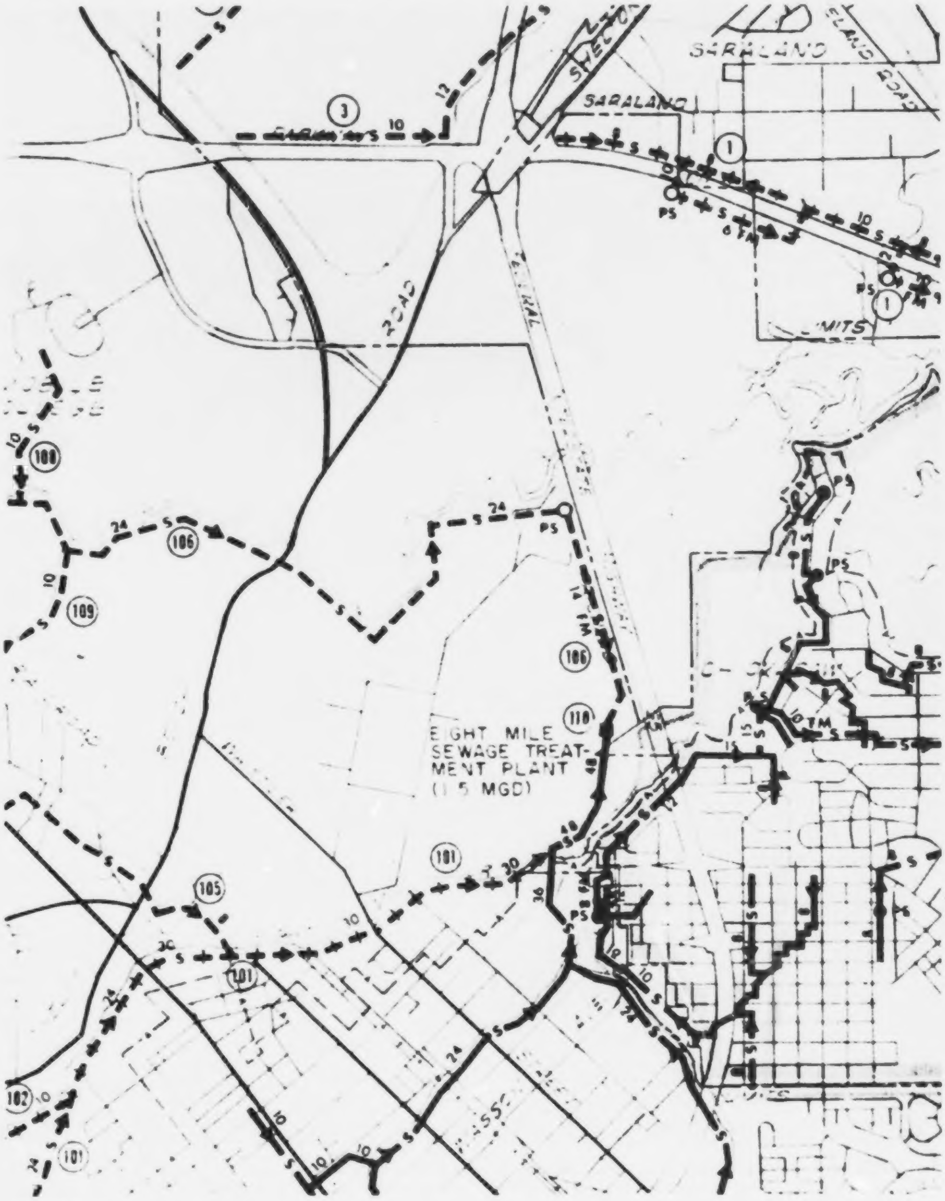


FIGURE 6

Mobile County

The cities of Mobile, Prichard and Chickasaw have generally adequate water and sewer facilities. The combined population of these cities is approximately 270,000. Thus, about two-thirds of the total Regional population is presently well-served by existing facilities.

However, better coordination of facilities is needed where the Mobile and Prichard service areas overlap. As for the rest of the county, Satsuma needs a sewer system, especially in the central business district along U.S. Highway 43. The low areas south of Mobile, particularly in the Bayou La Batre-Coden area, can no longer depend on septic tank sewage disposal which is inadequate, hazardous to health and will soon retard the development of the area. A sewage system is a real necessity. In most other sections of the county that do not already have water and/or sewer facilities, population density is usually too low to make it economically feasible to construct community systems. If and when these areas do experience sufficient growth to support water and sewer systems, then these should be constructed. Figure 7 is taken from the Mobile County Atlas and outlines existing and proposed sewer facilities for Chickasaw and surrounding areas.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14 TM
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MENT PLANT
(1.5 MGD)
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30
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FIGURE 7

Conclusion

The absence of large scale facilities in small communities may result in inadequate service, but it may also discourage development. In contrast, nearness to water and sewer mains and the presence of good drainage soils may encourage development. Thus, existing service installations themselves may influence development either negatively or positively.

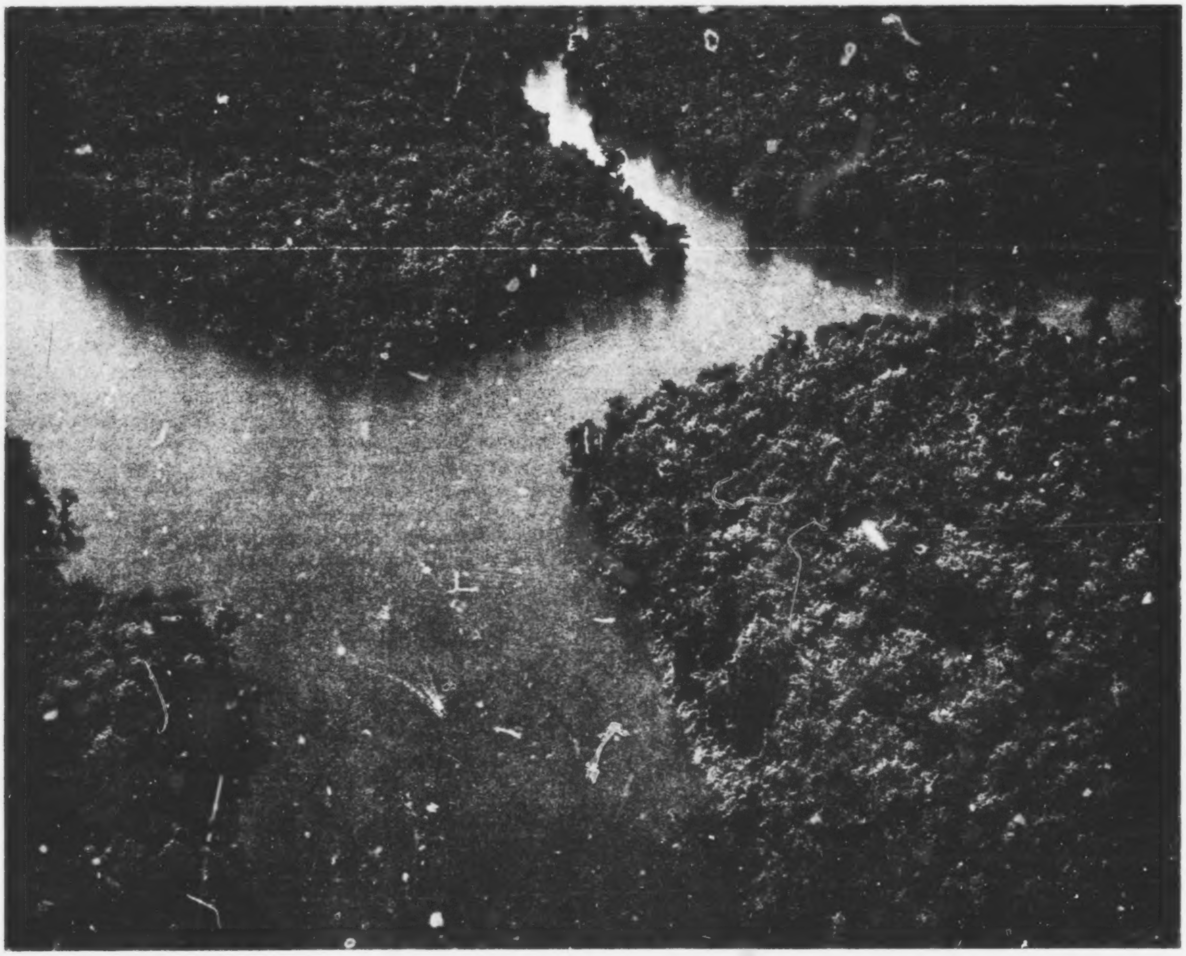
The two basic water and sewer services are deemed essential for an area to enjoy growth and development. It is important for all citizens and public officials alike to be cognizant of the pollution problems created by improper disposal of sewage and to take corrective action to implement a program of pollution abatement.

The primary, short range objective of proposals made for all communities in the three-county Region is to upgrade all existing systems so that they will adequately meet the demands of residents within the areas they now serve, and also to make service available to those populated areas that are presently not being served.

The secondary, long range objective is to plan development of water and sewer facilities to provide areas with adequate service as they grow and develop to the year 1990.

To fulfill both of these objectives, the analyses, evaluations and proposals found in these reports were made. Very detailed information, including maps, on existing and proposed water and sewer facilities for each community in the Region can be obtained from the offices of the South Alabama Regional Planning Commission.

The preparation of this Newsletter was financed in part through an urban planning grant from the Department of Housing and Urban Development, under the provisions of Section 701 of the Housing Act of 1954, as amended.



Regional water supplies are ample. However, continued pollution of our streams by domestic sewage and by commercial and industrial wastes is a matter of urgent concern. Polluted waters destroy the natural beauty of our environment, reduce wildlife and fish, inhibit enjoyment of water-oriented recreation and pose a serious threat to the health of our citizens.

MR. STEIN: Thank you.

Mr. Crockett.

MR. CROCKETT: Mr. Hugh A. McClellan, Marine Biologist, University of Alabama, representing the city of Bayou La Batre.

HUGH MC CLELLAN, MARINE BIOLOGIST
UNIVERSITY OF ALABAMA, MARINE SCIENCES
INSTITUTE, BAYOU LA BATRE, ALABAMA

MR. MC CLELLAN: Mr. Chairman, conferees, ladies and gentlemen.

Although claims of declining abundance by commercial fishermen are not generally accepted in scientific circles, the authors believe that their observations cannot be lightly dismissed merely because the fisherman is not a trained observer. Men dependent upon a natural resource for their livelihood inevitably make some correct observations regarding long term trends in abundance.

The problem in the planned abundance, particularly in the fishery resource, is to try to figure out why it happened. Now, we know that an unfished resource if we start fishing it will decline in abundance. Now, this decline may be a decline in the catch of a fisherman; it might be overfishing on the fisherman's part; it might gear competition, or it might be the normal reduction that we would expect from a pristine stock when we start fishing it. When we are fishing to get to the maximum sustained yield, which of course we are interested in, the basic stock is going to decline, we won't have as much, but in the long run we will be getting more.

Now, sometimes, and this is our case here, the only data that we have is just gross catch statistics. The data that I have on gross catch statistics are growing from the same source as is in the Federal report. The errors in doing so have been well alluded to in the Federal report, but this is all we have.

Additionally, we have three surveys that have been conducted on the oyster ratings in Mobile Bay. The last survey was in 1952, we had one in the early 1900's in about 1931, and one in the late 1800's, approximately 1890.

Oysters thrive in Mobile Bay since it is an estuary and they thrive there primarily because they can tolerate a more protracted interval of low salinities than can their chief enemies. Now, in these past 75 years at least three surveys have been conducted. Unfortunately, the survey by the State Conservation Department is not ready yet and it might alter drastically what I am going to say here today.

But can we have the first slide, please, sir. And I intend to just quite briefly hit this. If there are any questions,I will be glad to answer them.

(The following commentary accompanied the showing of slides:)

This is the 1890 survey, the 1931 survey and the 1952 survey. These fellows, of course, used all different ratings and we had to bring everything up to date to try to figure out really what they meant. And they are the ratings that they used and the ratings that I will be talking about here (indicating) as far as the areas, productive, nonproductive, depleted and extinct.

Next slide, please.

Now, for convenience I have broken Mobile Bay down into these three areas: Area 1, which includes the Bon Secour area; the Middle Bay area; and the Seaport Area.

Next slide, please.

Now, in Bon Secour Bay we only have two surveys overlapping here. The dotted areas represent the 1890 survey, the squares represent the 1952 survey. So you can see that essentially this area was little changed in about the 60 years. Notice that where the surveys overlap here that they are not quite in the same place. I believe somebody made an error in navigation, but essentially the areas available to oyster production are essentially the same.

Next slide, please.

In the middle part of the bay it is a vastly different story. Remember, the cross hatched area is 1952, the dotted area is 1890. As you see, we have lost an immense amount of area in the upper part of the bay which was formerly productive area. As Ritter said, an area of such production that it can be tonged readily for profit. So you can see about the only part that we have left over here on the western side of the bay is a small productive area here. These are now covered by spoil. The Klondyke reef today is not really a terribly desirable area for reasons that I will talk about later.

May we have the next slide.

Now, this is the very productive area in Alabama, the Cedar Point area, and essentially the area hasn't changed too terribly much since the earlier surveys. In the Portersville Bay area it is a different story. The report says that during closed areas here, of course this is a temporarily closed area, that the oystermen can go work in Portersville Bay. There are not very many oysters left in Portersville Bay for reasons I will talk about later.

Next slide, please.

We have gross catch statistics going back to about 1890. The dotted lines here represent years in which we did not have information and you can't really say that we had a decline like so. We really don't know what happened in between here. But this represents the average oyster catch since 1890, which is about a million pounds. Data was terminated in 1964 on this. As you can see from where we stood in 1964, it has been better but it has been worse too.

May we have the next slide.

Since 1944 data is available not only on the harvest, the annual harvest, but also on the catch for fishermen. Notice this is plotted on a logarithmic scale so that we can compare rates. Notice in particular these areas (indicating), areas in which both the catch and the catch per fisherman were declining at about the same rate. This represents a very marked decline in abundance. Also notice that apparently slightly above 1,000 pounds a year catch per fisherman represents the lowest economic level of abundance. Here the number of fishermen dropped off, the catch still decreased just a little bit, the catch per fisherman went up at about the same rate. So about--no, I am sorry, in the neighborhood of 800 pounds a year--wait--yes, that catch of slightly over 1,000 pounds a year is the minimum economic level of abundance. Beyond that level it is not worth doing. If he could do so, the oyster fisherman would turn to another area for his livelihood.

Next slide, please.

Here I think are the reasons that are operating.

Back several years ago when Mr. Allen was head of the Seafoods Division of the Department of Conservation he embarked on a program to try to move our oyster reefs, our main productive area, from this area that is the temporarily closed area, and he tried to move it this way (indicating) so that we could get out of the polluted area, we would have an area to turn to during the years in which closure was effected. This was largely unsuccessful because salinities are higher in here and it seems that the oyster drill as well as other parasites seem to do better than the oyster.

Up in this area it is pretty much too fresh for oysters year-round, they won't really grow there, and this is the marginal area which is, a small part of it, located in the State's permanently closed area. During some years if flow conditions are right we do have oyster reefs here to which the oyster fishermen can go get a few days work.

And really, I have only shown the major oyster reefs. To cover all the oyster reefs in Mobile Bay was almost an insurmountable task. An oysterman will go along maybe during shrimp season, pick up a few oysters in his trawl and say, hey, there is a little reef here. He doesn't tell anybody about it because he wants to come back and get it for himself.

But this area right here is a marginal area for growing oysters, but during some years we possibly could have a good oyster crop.

Here is what I think has happened down in this area. May we have the next slide.

Here we have Dauphin Island, Cedar Point, the highly productive area being located right in here. In 1893 the pass between Dauphin Island and Petitbois was in approximately this configuration, that we had an opening pass here of about one and a quarter miles. In 1962 we had about 4.4 miles and this, of course, led to a freer interchange of gulf water into the Mississippi Sound which has seriously damaged oyster production, both in Grad Bay and Portersville Bay.

Thank you.

(This concluded the slides.)

Up in the upper section of the bay another factor appears to be operating; it is still in the preliminary stages of analysis. If you take the catch statistics and plot it with the annual river flows with a two-year lag you will come up with a very close correlation approaching about 0.75 with waterflow and oyster production. We stand here today really not certain of what is happening, but we continue to change the flow regime coming into Mobile Bay, considering Mobile Bay or, as a matter of fact, any estuary as an entity within itself. It is not. The estuary is a result of the Gulf of Mexico and all the water that flows downstream to us. So we need to very seriously consider any further impoundments or anything that we do to change the flow characteristics of the upstream rivers emptying into Mobile Bay.

We would also like to see a model study performed on Mobile Bay by the Corps of Engineers at Vicksburgh before the channel dredging is complete or before it is started. Model studies have been performed on Tampa Bay and I believe Mobile Bay to be as economically valuable as Tampa Bay.

And we continue to talk about, well, put in small islands in Mobile Bay, small from the enlargement of the ship channel. We don't question that a larger ship channel is needed, but perhaps if we were to do a model study might we put these islands so that not only their damage would be minimized, perhaps we might obtain some benefit?

We also find ourselves in a situation of a wait and see attitude as far as thermal pollution in Mobile Bay. During the summertime we have recorded temperatures there in excess of 32 degrees. We are not actually a tropical area and many of the species that we have here are operating right now at the upper limit. We are unsure that we could tolerate a one degree rise in temperature. So that we would recommend that instead of a wait and see attitude on thermal pollution that we try to adopt some standard that will maintain our water temperatures pretty close to where they are.

That is all I have to say.

MR. STEIN: Thank you.

Any comments or questions?

I will refer to just the last point. We haven't approved the thermal pollution standards for Alabama yet. As I pointed out yesterday, you people in Alabama know your waters better than anyone else, as demonstrated by your presentation and other people's presentations here. It seems to me that you have the golden opportunity for the people of Alabama to get together and put a temperature standard in that will prevent thermal pollution, protect your waters, protect them from degradation and be such that the Federal people can accept it.

Again let me point out, the time is running out on this. If you don't come up with one, I, with all my charm, am going to have to come down and do it for you; and I don't want to do that. (Laughter.) I think it will be much better if you can work this out yourself.

MR. MC CLELLAN: Mr. Chairman, one other point. I hope that I have shown that the area that we have available for oyster production is pretty much hemmed in and that the only hope that we have is alleviation of this temporarily closed area. If we are to have any future oyster production in Alabama, this has to be done.

Thank you very much.

MR. STEIN: Thank you.

Mr. Crockett.

MR. CROCKETT: Is State Representative W. M. Collins in the audience?

I don't remember seeing him this morning. I know he was present all day yesterday and I personally know that he is interested in the matter being discussed at this conference.

Mrs. Guy W. Hicks, a resident of Point Clear, Alabama.

MRS. GUY W. HICKS
POINT CLEAR, ALABAMA

MRS. HICKS: Thank you, Mr. Crockett.

Ladies and gentlemen.

I am Mrs. Guy W. Hicks, a housewife, from Point Clear, and I have been vitally interested in our problems there concerning shellfish dredging of the Radcliff Materials Company. As far back as 12 years ago people have tried to oppose it and get some relief from it and we have been unable to do anything. I think so far they have managed to increase their demands on our reefs. I have positive proof that where their dredges are digging there are live oysters. An elderly gentleman, a doctor friend, Dr. G. C. Goddard of Point Clear, and his son were shrimping in November. They went over the reef right near the shell dredge and picked up at least a box of very delicious oysters.

I have written to the Corps of Engineers many times and also to Governors and to Congressmen and nothing has ever been done. I have here an extended permit that was given October 9, 1968, when Radcliff Materials were applying for a new three-year lease to dig dead shells in Mobile Bay. This was okayed by our own Department of Alabama Conservation. The only way that you can get this information is to be on the mailing list of the Corps of Engineers. Therefore, the public has no way to find it that I know of, I could be mistaken, but I have never heard of it being put out or publicized so the public could vote on it.

The little people who only own a home along the beach have suffered from the noises, the vibrations, the clanging, the lights, and the disgusting debris from this shell digging. We not only have suffered a great loss in residential--and this is a summer resort--people who rent their cottages have lost money because they can't swim; they cannot fish; we catch crabs that are diseased and polluted in our traps. I have called conservation men to come to my home and lift my crab trap and it is almost impossible at times to pick it up because of a large layer of sand and silt. Many times the crabs under their gills and their little bodies, I don't know how it gets there, you open them, they are filled with sand and residue and many times they are smothered.

These are some of our problems.

Then I would like to say that I think that the sewage problem in Mobile has been put off much too long and that I think the buck has been passed long enough. Too much money is squandered for tourist attractions. Our Federal Government is being bled to death by improvements. Over two years ago, less than two years ago, $100,000 was given to the committee to do this little beautification thing down by the Alabama battleship. One hundred thousand to put up some picnic tables and spread some grass.

And in the last Legislature I just don't know all of the $40 million, I think, for the State docks--I had it all written down, but in my excitement to get back today I left some of it home. I am sure that you could find it if you looked it up.

I guess that is about all the time I can take up, but I do appreciate your letting me be heard. I have here this permit from the Corps of Engineers with the drawing where they have leased the waters to dredge, if anyone would like to see that.

MR. STEIN: Thank you very much for your contribution, Mrs. Hicks.

We are going to take up that dredging problem and I am glad you called it to our attention. I think the Corps thinks that they are making the information public by putting it out, and I guess a Republican form of government doesn't carry democracy that far when we vote on these issues. We give it to the Executive Department to decide.

But I know the Corps likes to consider all views on this and does it after hearings. Certainly I am sure that they take our recommendations very seriously and we are going to take this up.

MRS. HICKS: Thank you very much.

MR. STEIN: Thank you.

Mr. Crockett.

MR. CROCKETT: Mr. Joseph V. Colson, Executive Director, Gulf States Marine Fisheries Commission, New Orleans, Louisiana. Mr. Colson is not in the audience?

Mr. B. I. Reynolds, a resident of Fairhope, Alabama.

B. I. REYNOLDS

FAIRHOPE, ALABAMA

MR. REYNOLDS: Mr. Chairman and ladies and gentlemen.

It is indeed a pleasure for a private citizen to come before this group to express an opinion. I am B. I. Reynolds, a resident of Fairhope, Alabama, and a property owner, a waterfront property owner.

I am glad to know that I am not the only one from the eastern shore complaining. The last time that a permit was requested for dredging in Mobile Bay I wrote a letter of protest to the U. S. Engineers on this dredging of the shells in the middle of the bay and received a reply in writing from them stating that mine was the only protest.

I would like to make a few points on this dredging. The dredging of these shells is an important and contributing industry, no doubt, to the economy of the communities and the economy of Mobile. The shells have a useful purpose. But I have noted that in dredging these shells and bringing up dead debris and other matter from the bottom of the bay these shells are washed and in the process of washing this sediment accumulates very rapidly in the surrounding area. And as ships proceed up and down Mobile Bay, this silt is washed more towards the eastern shore so that in my 40 years or more of living along the eastern shore I have seen the sands of our beaches turn from almost white to now a very dark brown.

So there is no doubt that this silt is having an adverse effect on our property along the eastern shore and it cannot help but have an adverse effect on the seafood. It is bound to smother the oysters. There has been a continuing decrease in fish, shrimp, crabs, and other products along the eastern shore and the entire bay, I should say, as well as damage to the shells.

At one time, incidentally, when this last application to the Engineers for shell dredging was placed and advertised by the Engineers as required by law, they had applied to dredge in Mississippi Sound, but because of the good organization in Bayou La Batre they withdrew their request to dredge in Mississippi Sound. Now, apparently the protests of the Bayou La Batre organization had been sufficient to induce somebody to believe that there is a damaging effect on oysters and other seafood, and apparently for that reason they withdrew their request for dredging in Mississippi Sound. They left that request in effect in Mobile Bay and the upper reaches of Mobile Bay.

The Engineers, since this matter had been apparently approved by the State of Alabama, had no alternative, since they had very few,or I will say according to what they told me,mine was the only protest against dredging. They had no alternative except to approve this dredging for another three years, their function being in the interests of navigation only.

Incidentally, however, in regards to navigation, since that time we have had some yachts from the eastern shore that have been grounded on these mounds that they leave outside of where they dredge. Now, according to their contract with the State of Alabama, they are supposed to put this residue back in a hole and fill up these holes that they dig. But if you will talk to the many shrimpers who have pulled their trawls in Mobile Bay, both amateur and professional, there have been many trawls lost in these sink holes. And as I say, many yachts have been trapped on these bars.

I am very strong in my belief that this silt is having a damaging effect on all the seafood in Mobile Bay and Bon Secour Bay, and I think it has been doing most of its harm along the eastern shore, I should say. I believe probably that Bayou La Batre is escaping the worst part of it.

While I am on the subject of dredging, the other dredging that has been done by commercial dredging companies of the channel seems to be done without regard to the pleasure boat owners who might wish to fish and navigate in Mobile Bay. This sediment has stacked up and forms almost a virtual wall along the eastern side of the ship channel for certain periods and many boat owners have sustained damage going onto these mounds of dirt. It is my belief that the responsibility should rest with the U. S. Engineers to mark these spoils or spoil areas so that the pleasure boat owner will know where he may run into damage.

There used to be a cut or a channel or a creek running down from Mobile River that went across Pinto Alley. I am not sure of the name of it, but years ago there was an Engineers' base over there and I don't know how many--whether anyone is familiar with that stretch of water, but the smaller boats were able to go from the inner harbor over into the bay, I would say back or south of where the present battleship is. If there is anybody in the audience who can tell us what that pass is called or something, why, it would give us more enlightenment on that.

At any rate, this dredging spoil has been allowed to fill that place up to where now at low tides a small boat can't even get through there. There has been no regard, apparently, during the process of dredging the channel or the harbor for this other channel that was in use, for many of the small boat owners who didn't want to go down necessarily to the middle of the bay and then turn around and come back up the other side.

Another point, while we are on ship channels, the steamship pollution is quite a problem. Forty years ago when I went to London on a merchant ship, the minute we went into an inner harbor all of our toilets had to be sealed and there was no further sewage allowed to be disposed of in the harbors of London and other British ports. This is something that we have been very lax in doing, in handling in the United States. I don't know at what point we are with controlling steamships or bringing about retention facilities onboard, but I think that is as important as this other matter of pollution. Certainly these ships are doing a big job of pollution.

And as these ships speed up and down Mobile Bay--again I will bring out that they wash this debris or this sediment that the shell dredging is bringing up--the waves of the ship tend to go to the eastern shore, and it has gotten so bad these waves have at times turned over 16-foot pleasure boats which were moored out in the bay. I think this is a problem that probably is not necessarily pollution; it is probably jointly with navigation with the Engineers, but I am speaking now of the pollution in the steamships.

Recently the city of Fairhope and the city of Daphne have applied, as I understand it, or are planning to apply to put in new sewerage facilities. Well, Daphne doesn't have one; they are putting in their first system. Fairhope is putting in an expanded system and they have requested to use the primary and secondary type systems, I am not sure of the professional term, but these consist of sediment basins or settlement basins. And Fairhope has applied to use this system and Daphne has applied to use this system, but as I understand it, the State, through its medical facilities, has turned this down and they are demanding that a system be installed which will discharge the water coming or whatever the content that comes out of the sewerage line directly into Mobile Bay. Now, in the last few days I am sure some of you have noticed on the news that in Cincinnati, Ohio, where they have one of these systems that discharges directly into an estuary or into a bay this system failed and is now discharging raw sewage into I guess the Ohio River. I feel like the sediment basin system is much safer and much less opportunity for failure and will not be discharging directly into Mobile Bay. I believe the discharge from that will be of a better nature, more nearly pure content, and I don't know why those two communities are being forced to discharge into Mobile Bay when other communities are allowed to use the sediment system.

I want to make it clear that I am speaking here merely as a private citizen, but as a property owner and a taxpayer and interested party in this matter. I believe that the sediment system, which consists of a primary basin and a secondary basin, will have less chance of failure and less chance of pollution of Mobile Bay. Probably our fine State Representative here could give us an answer on this matter or someone as to why these two communities must set up a system that discharges into the bay and are prevented from using this alternative and preferable twin basin system or twin sediment pond system.

I thank you very much for your time.

MR. STEIN: Thank you, Mr. Reynolds, for your statement.

Mr. Crockett.

MR. CROCKETT: Mr. Reynolds, in response to your question concerning the types of systems which the Water Improvement Commission has indicated it will approve for Daphne and Fairhope, Fairhope presently discharges treated sewage from a secondary plant of the trickling filter type. This is biological treatment. It goes into Mobile Bay. The sedimentation type I think you were talking about is what we call a waste stabilization lagoon.

Now, in order to use a waste stabilization lagoon, you have to have considerable property available; as a matter of interest to you, one acre is required for each 300 people. In Fairhope there is no place or no site on which the city could build the size of lagoon that would be needed. It would still have to go into the bay if they went inland. The site just hasn't been found yet where they could build this type of system.

There has been no final decision made with the municipal grant for Fairhope. There has been no final decision made concerning nonuse of the stabilization type in Daphne. If they can find the sites back inland on which they could build these lagoons and pipe the wastes into the bay, we would accept them.

You may have heard or you may not have been here yesterday, but this would also require disinfection, which, as I stated yesterday, has some technological problems involved so far as disinfection of stabilization lagoon effluents. You may rest assured that the most advanced treatment that will be economically feasible for these two communities will be required.

MR. STEIN: Do we have anyone else?

MR. CROCKETT: Let me ask if Mr. Dan C. Alexander, Jr., is in the audience? I think he was here yesterday.

Mr. Chairman, I have no other persons who have indicated a desire to make a statement today. I would like to express on behalf of the Water Improvement Commission and the State Department of Health the patience of many of these people who have come here and sat through a day and a half, waited for an opportunity to speak, and also the time which they went to to prepare their statements. We are deeply grateful for your participation.

(The following documents were submitted by Mr. Crockett:)

Alabama Dry Dock and Shipbuilding Co.
POST OFFICE BOX 1507
Mobile, Alabama 36601

CABLE ADDRESS
"DRYDOCK MOBILE"

AREA CODE 205
432-8821

January 23, 1970

Water Improvement Commission
Rooms 324 - 326
State Office Building
Montgomery, Alabama 36104

Attention: Mr. Arthur N. Beck
Technical Secretary

Subject: Conference, Mobile, Alabama
January 27, 1970, Mobile Bay Pollution

Gentlemen:

Your letter of January 6, 1970, relating to the above subject and addressed to the undersigned is acknowledged.

In reply, Alabama Dry Dock and Shipbuilding Company does not wish to make a verbal statement at the meeting, but does submit the following for inclusion in the records of the meeting.

ADDSCO is engaged in the business of ship repair and shipbuilding and is not a process industry. During the years of World War II total employment on Pinto Island was in the neighborhood of 33,000, but for the past twenty five years the average employment was about 2500 to 3000. The present work force totals 2800 more or less. The company has employed Consulting Engineers to survey the present disposal system for domestic waste and to recommend a plan for collection so as to eliminate the discharge of raw sewage into slips adjacent to Mobile River. We are advised that the survey will be completed within four to six months.

Alabama Dry Dock and Shipbuilding Company has initiated this action of its' own volition and in its' continuing effort toward compliance with Federal and State Laws and Regulations which have been established for the protection of all citizens.

Very truly yours,

ALABAMA DRY DOCK AND SHIPBUILDING COMPANY

N. DeP. Knight
Administrative Vice President
and Secretary

NDePK/ar

January 19, 1970

Mr. Arthur Beck
Technical Secretary
Water Improvement Commission
State Office Building
Montgomery, Alabama 36104

Dear Mr. Beck:

Pursuant to your letter of January 6, 1970, concerning bacterial pollution of Mobile Bay, the attached Policy Statement establishes the position of the Mobile County Board of Health.

We do not desire to present a statement at the public hearing to be held in Mobile on January 27, 1970, but it is requested that the attached position statement be made a part of the official records pertinent to the pollution of Mobile Bay and its adjacent tributaries.

Sincerely yours,

M. C. Clark, D.V.M., M.P.H.
Assistant Health Officer

MCC:bm
Enc.

cc: Mr. Murray Stein

POLICY STATEMENT

MOBILE COUNTY BOARD OF HEALTH

The Mobile County Board of Health is legally charged with responsibility for the health of all citizens of Mobile County. Sanitary disposal of sewage is a part of this responsibility. The Board of Health is compelled to enforce the regulations for human waste disposal as established by the State Department of Public Health and consequently will vigorously pursue the course. The Board is concerned about the amount of raw, untreated sewage being discharged into the bayou, both directly and indirectly, not only from the standpoint of pollution and additional biochemical oxygen demand of this raw sewage, but the health aspects of this unsanitary practice as well.

During June 17, 18, 19, 1969, the Division of General Sanitation, Mobile County Board of Health conducted a sanitary survey of Bayou La Batre and adjoining areas pertinent to sewage disposal. Results of this survey revealed that out of 594 residences, business establishments, and seafood processors 441 of 74% had unacceptable or unsatisfactory sewage and/or liquid waste disposal systems. Further breakdown showed that 77% of area residences were using unacceptable waste disposal measures and that of all the business establishments, 53% were unacceptable. Excluding seafood processors, we found 40% of the retail business to be unacceptable. Seafood processors as such were 100% unacceptable because liquid waste disposal was achieved by discharging untreated wash water directly into the bayou. It is estimated that such wash water contains over 3600 pounds of biochemical oxygen demand per day.

A significant number of business establishments discharge septic tank effluents directly into the storm drain sewers while other business establishments discharge untreated sewage directly into the bayou.

MR. STEIN: Thank you, Mr. Crockett.

I think the conferees are going to close the public session of the meeting. As I take it, no one else wishes to speak. We will go into Executive Session, and because of the problem of lunch, and getting the reproduction working without lunch I think we will reconvene back in this room and have an announcement between 4:30 and 5.

With that we stand recessed until then.

(Whereupon, at 1:15 o'clock, the conference stood at recess until 4:30 o'clock.)

CONCLUSIONS AND RECOMMENDATIONS

MR. STEIN: Let's reconvene.

I would like to thank you all for coming and participating in the conference. The conferees, I am happy to report, have arrived at unanimous conclusions and recommendations.

As you probably understood in attending the conference, we are dealing with a very complex situation and a situation where we are on the forefront of the art. In no small measure you will find that conference recommendations reflect the statements and the testimony given by you participants to the conference and your answers to questions, and so forth. The points you brought up I believe are reflected in these recommendations.

Conclusions:

1. Shellfishing areas in Mobile Bay have been closed by the State of Alabama during portions of eight of the past sixteen years because total coliform densities over the beds exceeded the 70/100 milliliters total coliform standard for shellfish harvesting.

2. A comparison of monthly production figures for shellfish harvesting in Mobile Bay from 1954 to 1967

during open and closed periods show substantial harvesting losses and, consequently, substantial economic losses during the closure periods.

3. The most significant source of coliform pollution to Mobile Bay is the Mobile River. The coliform pollution entering Mobile Bay from the Mobile River is transported down the western shore of the bay to the major shellfishing areas during flood runoff periods. The great majority of both total and fecal coliforms entering the bay from the Mobile River originate in the Mobile metropolitan area.

4. The median total coliform densities in the Mobile River at the mouth during flood runoff periods ranged from 150,000 to 1,000 MPN/100 milliliters. Seventy-seven to ninety-four percent of this total resulted from discharges in the Mobile metropolitan area. The corresponding range of median fecal coliform densities in the river at the mouth was 930 to 300 MPN/100 milliliters. Sixty to seventy-nine percent of this total resulted from discharges in the Mobile metropolitan area. During a low flow period examined, the respective median total and fecal coliform concentrations at the mouth of the Mobile

River were 9,300 and 2,300 MPN/100 milliliters. The contribution of Mobile metropolitan area amounted to 96 to 97 percent of the total coliform densities and 99 percent of the coliform densities flowing into Mobile Bay from the river.

5. Ninety-seven percent of the Mobile area's municipal waste is now receiving secondary treatment and chlorination; construction is now under way covering the other three percent. However, the coliform density increases in the Mobile River indicate that excessive quantities of total and fecal coliforms are being discharged by Mobile's Threemile Creek and Eslava Creek sewage treatment plants, Chickasaw Lagoon, Stone Container Corporation, National Gypsum Corporation, Scott Paper and International Paper.

6. The most significant contributor of bacterial pollution from point sources in the Mobile metropolitan area is the presently untreated section of Mobile. The median total and fecal coliform population equivalents from this source are 46,500 and 13,700 BPE respectively. This waste accounted for 50.3 percent of the total coliform and 58.3 percent of fecal coliform

contributed from all sources. The second major source is the International Paper Company which discharges 36,040 or 38.9 percent of the total coliform and 6,300 BPE or 26.9 percent of the fecal coliform.

7. The four industrial effluents sampled by the Federal Water Pollution Control Administration, International Paper Company, Scott Paper Company, National Gypsum Company and Stone Container Corporation, contribute 43,000 BPE or 46 percent of the total coliform and 8,400 BPE or 33.6 percent of the fecal coliform discharged in the Mobile metropolitan area. The eight domestic waste sources sampled discharged 3,440 BPE or 3.7 percent of the total coliform and 1,500 BPE or 6.1 percent of the fecal coliform.

8. During the periods of time when they occur, stormwater overflows are significant sources of coliform pollution. During the relatively light rainfalls when stormwater sampling was conducted, coliform contributions in stormwater runoff amounted to 4 to 18 percent of the 92,500 BPE total coliform and 23,500 BPE fecal coliform pollution from point sources. More intense rainfalls would likely produce a greater percentage.

Conclusions and Recommendations

9. There is a direct, though imprecise, relationship between river flow in the Mobile River above Mobile and both total and fecal coliform densities. As river discharges increase, total and fecal coliform densities will also increase irrespective of point sources of waste.

10. The concentrations of total and fecal coliform in the Mobile River above Mobile during high flood runoffs are such that even if the bacteriological contribution from all sources at Mobile were removed and all other conditions remained constant, it is doubtful whether the 70/100 milliliters total coliform criterion for shellfish harvesting could be met anywhere in Mobile Bay except Bon Secour Bay.

11. Sewage, stormwater overflows, and industrial wastes discharged to the Mobile River from the Mobile metropolitan area, and excessive concentrations of total and fecal coliform in the Mobile River above Mobile during high flood runoff, result in pollution of Mobile Bay by bacteria. Because of this pollution, the State of Alabama, under the laws of the State and the rules and regulations of the Alabama State Board of Health governing the

production, shucking and handling of oysters, has closed a significant portion of the Mobile Bay waters to the direct harvesting of shellfish. These closures have caused substantial economic injury resulting from the inability to market shellfish or shellfish products in interstate commerce. Accordingly, the pollution of these navigable waters is subject to abatement under the provisions of section 10 of the Federal Water Pollution Control Act, as amended (33 U.S.C. 466 et seq.).

Recommendations:

It is recommended that a pollution abatement program requiring the following measures shall be instituted:

1. In addition to secondary treatment plus disinfection by municipal sources in the Mobile area, effective year-round disinfection and other needed improvements shall be provided for all municipal sources. Adequate collection and secondary treatment plus disinfection of sewage from subdivisions, commercial and institutional* sources shall be provided. Operation of all waste treatment facilities shall accomplish the highest possible removal efficiencies at all times. This recommendation is to include the following specific

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* As corrected - see page 539

measures for the sources of municipal wastes listed below:

A. Threemile Creek sewage treatment plant (Mobile)--Effective disinfection of waste effluent at all times.

B. Eslava Creek sewage treatment plant (Mobile)--Expansion of plant capacity and effective disinfection of waste effluent at all times.

C. Stormwater overflows (Mobile, Prichard, Chickasaw)--Regulate maintenance program of debris clearance from drains.

D. Fairhope sewage treatment plant--Expansion of plant capacity and effective disinfection of waste effluent at all times.

E. Bayou La Batre, Daphne, Satsuma, Alabama--Construction of collection systems and secondary sewage treatment facilities including effluent disinfection to replace septic tanks serving individual homes.

2. The Alabama Water Improvement Commission report to conferees within six months on adequacy of the quality of the effluent discharged from Chickasaw waste

lagoon and outline any remedial program which might be indicated.

3. All industries shall provide secondary treatment for both process and domestic wastes and effective disinfection where appropriate. Specifically, the following program is to be carried out by existing industries:

Industrial Sources

1. International Paper Co.
2. Scott Paper Co.
3. National Gypsum Co.
4. Stone Container Corp.
5. Alabama State Docks

A) Separation of process and domestic wastes.

B) Secondary treatment to meet appliceable State and Federal standards and effective disinfection at all times for domestic wastes or connection to the municipal sewer system.

C) Secondary treatment for process wastes at all times and effective disinfection where appropriate to meet applicable State and Federal standards.

Conclusions and Recommendations

4. The seafood processing plants in Bayou La Batre and other locations in and around Mobile Bay without adequate treatment shall:

A. Provide screening and separate disposal of gross solids such as hulls and heads resulting from the processing of shrimps, crabs and other seafood products.

B. Provide secondary treatment of washwater resulting from machine peeling, processing and packing of peeled shrimp and the packing of whole, unpeeled shrimp. Such treatment could be provided as part of the municipal waste collection and treatment system.

5. All recommended abatement measures shall be in operation no later than February 15, 1973, as detailed in the Alabama water quality standards, approved by the Secretary of the Interior on February 15, 1968.

6. In determining acceptability of areas in Mobile Bay for shellfish harvesting, a more realistic criterion than the present method be employed to more effectively evaluate the probability of pathogen presence.

Conclusions and Recommendations

A coordinated effort by the U. S. Department of Health, Education, and Welfare and the U. S. Department of the Interior in cooperation with the States should be undertaken immediately to develop such a criterion with respect to approval of areas for shellfish harvesting. A technical committee shall be established by the conferees to assist in the development of such a criterion. This committee should report to the conferees no later than one year from the date of the first session of conference.

7. The Federal Water Pollution Control Administration, the U. S. Corps of Engineers, the Alabama Water Improvement Commission, and the State Department of Conservation establish a technical committee and in six months report to the conferees an analysis of the dredging situations in Mobile Bay and its tributaries for a recommended program for future operations.

That concludes the recommendations and conclusions of the conferees. Before we terminate the conference and have the conferees available for individual questioning and comment, are there any statements any of the conferees wish to make?

I understand I misquoted one. We are dealing with sources of pollution other than municipal sources. I read industrial instead of institutional. We do mean that this type of secondary treatment not only be provided for the municipal wastes in the area but for those commercial and institutional sources lying outside these municipal systems and the subdivisions

Thank you.

Are there any other comments?

If not, again I want to thank you all for coming and participating with us. I hope this will enable us to move forward together toward a cleaner Mobile Bay.

Thank you again and we stand adjourned.

(Whereupon, at 5 o'clock the conference was adjourned.)

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